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**BRIDGETON LANDFILL - WEST LAKE LANDFILL**

**GAMMA CONE PENETRATION TEST (GCPT)  
HEALTH AND SAFETY PLAN  
REVISION 1**

**BRIDGETON, ST. LOUIS COUNTY, MISSOURI**

**Prepared For:  
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Bridgeton, MO 63044**

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# GCPT Health and Safety Plan

## *Bridgeton Landfill, LLC*

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# 1 INTRODUCTION

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This Health and Safety Plan (HSP) was developed for Feezor Engineering, Inc. (FEI) employees and subcontractors under agreement with FEI for subsurface investigations in the southern portion of Operable Unit 1 (OU-1), Radiological Area 1 (Area 1) of the West Lake Landfill immediately to the north of Permitted North Quarry Landfill at the Bridgeton Landfill.

The purpose of this HSP to provide background information and establish standard personal protection standards and health and safety policies/procedures for work practices of FEI and Subcontractor employees during performance of subsurface investigations along the south side of Area 1. Prior to any work, a copy of this HSP will be distributed to all FEI employees and subcontractor personnel involved with this work. Prior to anyone beginning work, they will be required to read this HSP and sign the Compliance Agreement included in Appendix A.

The levels of protection and the procedures specified in this HASP are based on information available at this time, and represent the minimum health and safety requirements to be observed by all FEI and Subcontractor employees while engaged in this project. Unforeseeable site conditions may warrant the use of higher levels of protection. Subcontractors are required to provide the necessary safety equipment and safety training to their personnel in compliance with the Occupational Safety and Health Administration (OSHA) regulations provided in 29 CFR 1926.

The content of this HSP may change or undergo revision as additional information is obtained during the field activities. Any changes to this HSP must be reviewed by the Project Health and Safety Officer and are subject to approval by the Project Manager.

Field personnel must read this document carefully. If you have any questions or concerns that you feel are not adequately addressed, ask your supervisor or the Project Health and Safety Officer. Follow the designated health and safety procedures, be alert to the hazards associated with working on any construction site in close proximity to heavy equipment, and above all else, use common sense and exercise reasonable caution at all times.

The HSP is organized as follows:

- Section 2 describes the project safety personnel;
- Section 3 provides information regarding the West Lake Landfill site;
- Section 4 summarizes the field activities to be conducted as part of the subsurface investigations;
- Section 5 presents an evaluation of the hazards that may be encountered during the performance of the field activities and includes control measures for the hazards;
- Section 6 includes general training requirements;
- Section 7 describes the general health and safety procedures to be employed during the field activities; and



- Section 8 lists the emergency contacts and the procedures to be implemented in the event of an accident or other emergency.

## 2 PROJECT SAFETY PERSONNEL

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Personnel responsible for project safety during performance of the subsurface investigations along the south side of Area 1 are the Project Manager, the Project Health and Safety Officer, and the On-Site Health and Safety Officer for each subcontractor.

The Project Health and Safety Officer has responsibility for establishing appropriate health and safety procedures for the project (as presented in this Health and Safety Plan) and has the authority to implement those procedures including, if necessary, the authority to temporarily shut down the project for health and safety reasons. The On-site Health and Safety Officer for each subcontractor will be responsible for assuring that the procedures specified in this Health and Safety Plan are implemented in the field and also has the authority to temporarily shut down the project for health and safety reasons. The Project Manager will have overall responsibility for project health and safety and has the authority to take whatever actions may be necessary to provide a safe working environment for all Subcontractor personnel. The personnel fulfilling these responsibilities and their mobile telephone numbers are included in Table 1.

The ultimate responsibility for the health and safety of the individual employee rests with the employee. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety, and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of their fellow employees and the appropriate health and safety personnel.

Should an employee find himself or herself in a potentially hazardous situation, the employee shall immediately discontinue the hazardous procedure(s) and personally take appropriate preventative or corrective action, and immediately notify the Site Health and Safety Officer of the nature of the hazard. Any site personnel may stop any work activity that is assessed to be an imminent safety hazard, emergency situation, or other potentially dangerous situation. Once work has been halted for any safety reason, the On-site Health and Safety Officer for the specific contractor and Project Manager must be notified immediately by the party calling for the stop. The reasons for the work stoppage will be discussed with the On-site Health and Safety Officer and the Project Manager. The Project Manager will make the decision as to whether work may continue or if actions need to be taken to correct an unsafe situation or activity.

### 3 SITE INFORMATION

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This section includes discussions on the site location and surrounding areas, historical landfill operations and disposal areas, the Superfund Operable Units, and current site uses. Information regarding climate in the area and surface water runoff drainage patterns are also provided.

#### 3.1 SITE LOCATION AND SURROUNDING AREA

The site includes the permitted North and South Quarry Landfills that make up the Bridgeton Sanitary Landfill and the former Demolition Landfill, Inactive Sanitary Landfill and Radiological Areas 1 and 2 that make up the West Lake Landfills. The site is located within the western portion of the St. Louis metropolitan area on the east side of the Missouri River floodplain approximately two miles east of the river. The landfills are located approximately one mile north of the intersection of Interstate 70 and Interstate 270 within the city limits of the City of Bridgeton in northwestern St. Louis County.

The site is bounded to the east and northeast by St. Charles Rock Road (State Highway 180) [Figure 1]. Commercial and industrial properties bound the site immediately to the north, across St. Charles Rock Road to the north and east, and to the south. The site is bounded on the west by Old St. Charles Rock Road (vacated) and the Earth City Industrial Park stormwater/flood control pond. The Earth City commercial and industrial complex continues to the west and north of the stormwater/flood control pond and extends from the site to the Missouri River. Earth City is separated from the Missouri River by an engineered levee system.

#### 3.2 HISTORIC LANDFILL OPERATIONS AND DISPOSAL AREAS

The West Lake Landfill is an approximately 200-acre parcel containing multiple areas of past operations. The site was used agriculturally until a limestone quarrying and crushing operation began in 1939. The quarrying operation continued until 1988 and resulted in two quarry pits, the North Quarry Pit and the South Quarry Pit (Figure 1), which were excavated to maximum depth of 240 feet below ground surface (bgs) (Herst & Associates, 2005).

The West Lake Landfill is the site of several areas where solid wastes have been disposed. Beginning in the early 1950s or perhaps the later 1940s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes, and construction/demolition debris. The Bridgeton Sanitary Landfill waste mass encompasses approximately 52 acres with approximately 240 feet below the ground's surface and a total waste thickness of 320 feet. The waste is located in two distinct areas known as the North and South Quarries. The Bridgeton Sanitary was initially permitted on Nov. 18, 1985 and ceased accepting waste on Dec. 31, 2004 pursuant to an agreement with the City of St. Louis to reduce the potential for birds to interfere with airport operations. The Bridgeton Sanitary Landfill is inactive and closure activities are proceeding under Missouri Department of Natural Resources (MDNR) supervision.

In addition to the Bridgeton Sanitary Landfill north and south quarry pits currently in the process of closure/post-closure, the West Lake Landfill property contains four other areas where solid wastes were disposed (Figure 1):

- Area 1 where solid wastes and radiologically-impacted materials were disposed;
- Area 2 where solid wastes and radiologically-impacted materials were disposed;
- A closed demolition landfill; and
- An inactive sanitary landfill.

The Bridgeton Landfill includes the North and South Quarry Permitted Landfill cells. Waste disposal activities in these areas began in 1985 with filling of the North Quarry Landfill and continued with placement of solid wastes progressing to the south until the South Quarry Landfill was filled. Waste disposal activities at the Bridgeton Landfill ceased in 2004 and a final soil cover was subsequently placed over the North and South Quarry Landfills. In 2013, a geosynthetic cover composed of a green 60 mil Ethylene Vinyl Alcohol (EVOH) liner was installed over the South Quarry Landfill to reduce the potential for odor emissions. Enhancements to the landfill gas extraction and leachate collection systems at the South Quarry Landfill were also installed prior to and during that cap installation.

### 3.3 SUPERFUND OPERABLE UNITS

Superfund-program remedial action at the site is divided into two operable units (OUs). OU-1 is comprised of the solid wastes and radiologically-impacted materials disposed in Areas 1 and 2 and portions of an adjacent property, the Buffer Zone/Crossroad Property.

OU-2 consists of the other landfill areas that are not impacted by radionuclides and includes the inactive sanitary landfill located adjacent to Area 2, the closed demolition landfill, and the Bridgeton Sanitary Landfill located in the North and South Quarry Pits. The closed demolition landfill and the Bridgeton Sanitary Landfill, while designated as part of OU-2, are regulated by the MDNR pursuant to State of Missouri solid waste regulations and are not being actively addressed by the Superfund program.

Area 1 is situated on the northern and western slopes of a topographic high within the overall West Lake landfill property. Ground surface elevation in Area 1 varies from 490 feet above mean sea level (AMSL) on the south to 452 feet AMSL at the roadway near the transfer station entrance (Figure 2).

Area 2 is situated between a topographic high of landfilled materials on the south and east, and the Buffer Zone/Crossroad Property on the west. The highest topographic level in Area 2 is about 500 feet AMSL on the southwest side of Area 2, sloping to approximately 470 feet AMSL near the top of the landfill berm (Figure 2). The upper surface of the berm along the western edge of Area 2 is located approximately 20 to 30 feet above the adjacent Buffer Zone/Crossroad Property and approximately 30 to 40 feet higher than the water surface in the flood control channel located

to the south-west of Area 2. A berm on the northern portions of Area 2 controls runoff to the adjacent properties.

Municipal solid waste, construction and demolition debris, quarry spoil material and possibly other wastes were disposed of in Areas 1 and 2. Reportedly, 38,000 to 39,000 tons of soil were mixed with approximately 8,700 tons of leached barium-sulfate residue, and of this amount, 43,000 tons were sent to West Lake Landfill over the period from July through October 1973 (Nuclear Regulatory Commission [NRC], 1976 and 1988 and RMC, 1982). Post-disposal investigations by the NRC suggest that the 43,000 tons of soil mixed with leached barium-sulfate residue were spread and used as cover material for the landfill operations. Per the NRC, "This material was hauled to the landfill area and used as cover for part of the several hundred truckloads of garbage and refuse that are shipped to the landfill area site every week." Landfilling of waste materials continued to be performed both during and after disposal of the radiologically-impacted soil mixture .

Radiological constituents in Areas 1 and 2 occur in soil materials that are intermixed with and interspersed within the overall matrix of landfilled refuse, debris and fill materials, and unimpacted soil and quarry spoils. In some portions of Areas 1 and 2, radiologically-impacted materials are present at the surface; however, the majority of the radiological occurrences are present in the subsurface beneath these two areas. At the Buffer Zone/Crossroads properties the radiologically-impacted materials are found in soils believed to have been carried by erosion from the Area 2 berm prior to growth of the current on-site vegetation.

In general, the primary radionuclides detected at levels above background concentrations at the West Lake Landfill are part of the uranium-238 and uranium-235 decay series. Thorium-232 and radium-226 isotopes from the thorium-232 decay series are also present above background levels but at a lesser frequency.

### 3.4 CURRENT SITE USES

The West Lake Landfill is located in a predominantly industrial area. The entire landfill area, including the areas investigated under OU-1 and OU-2, has been the site of historic quarry operations to remove limestone, and landfill operations. Other activities on the OU-2 portion of the property include a solid waste transfer facility, concrete and asphalt batch plant operations, and an auto repair facility (Figure 1).

With the exception of the Buffer Zone, all of the site area has previously been developed and was used for or in conjunction with disposal of solid wastes at the site or is currently being used in conjunction with the various industrial operations conducted at the Site. Areas 1 and 2, the closed demolition landfill, the inactive sanitary landfill, and the former Bridgeton Sanitary Landfill located in the North and South Quarry pits (Figure 1) were all used for disposal of solid wastes. Current activities in these areas consist of maintenance of the landfill covers and environmental

monitoring. Extraction of leachate continues to be performed on an ongoing basis from the North and South Quarry Pits.

In addition to the area containing the transfer station entrance road and site office trailer/weigh station, there are two areas located outside of the solid waste disposal units in which industrial activities are conducted at the site. These include the area in the central portion of the site where the solid waste transfer station and the concrete and asphalt batch plants are located, and a small area near the southwestern portion of the site in which an automobile repair facility is located (Figure 1). In addition to these areas, the Republic Services district office and refuse collection vehicle parking and repair lots are located outside of but adjacent to the site. The landfill stormwater retention pond and OU-2 on-site soil borrow and stockpile area are also located on property outside of but adjacent to the site (Figure 1).

### 3.5 CLIMATE AND METEOROLOGY

The climate of the landfill area is typical of the Midwestern United States with a modified continental climate that has four distinct seasons.

Winter temperatures are generally not severe with the first frost usually occurring in October and freezing temperatures generally not persisting past March. Records since 1870 show that temperatures drop to zero °F or below an average of two or three days per year. Temperatures remain at or below freezing less than 25 days in most years. Summers in the St. Louis area are hot and humid. The long-term record since 1870 indicates that temperatures of 90 degrees Fahrenheit or higher occur on about 35 to 40 days per year. Extremely hot days of 100 degrees Fahrenheit or more generally occur no more than five days per year.

Normal annual precipitation as measured at nearby Lambert Field International Airport based on records dating back to 1871 is a little less than 34 inches. The three winter months are usually the driest, with an average total of approximately 6 inches of precipitation. Average snowfall per winter season is slightly greater than 18 inches. Snowfall of an inch or more is received on five to ten days in most years. Record snowfall accumulation over the past 30 years was 66.0 inches recorded during the 1977 –78 winter season. The spring months of March through May are the wettest with normal total precipitation of just under 10.5 inches. Thunderstorms normally occur 40 to 50 days per year. During any given year, a few of these storms can be classified as severe with hail and damaging wind. Tornadoes have occurred in the St. Louis area.

Between December and April, the predominant wind direction at Lambert Field is from the northwest and west-northwest. Throughout the remainder of the year, the predominant wind direction is from the south. Considering potential differences in topography between Lambert Field and the West Lake Landfill, the actual wind directions at the landfill may be slightly different, possibly skewed in a northeast-southwest direction parallel to the Missouri River valley.

## 4 DESCRIPTION OF WORK

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Additional subsurface investigation may be conducted to provide data to assist in locating and designing a possible subsurface thermal barrier that may be installed in the future, if determined to be necessary, between the North Quarry Landfill and the radiologically-impacted material (RIM) in Area 1. The objective of the subsurface investigation is to assist in locating a suitable alignment for a subsurface barrier for limiting migration of a subsurface smoldering event that may occur in the North Quarry Landfill from migrating into the RIM in Area 1. The subsurface investigations will be performed using a cone penetrometer drilling rig equipped with a cesium-iodide detector for characterization of gamma radiation. The Gamma Cone Penetrometer Testing (GCPT) will provide data on nature and geotechnical properties of the subsurface materials encountered while inclusion of the cesium iodide detector will allow for detection of RIM materials.

The general activities to be conducted during the GCPT investigation in the southern portion of Area 1 include the following:

- Surveying of the proposed GCPT boring locations and the alignments to be used to reach each of the GCPT boring locations;
- Performance of surficial gamma survey around each of the proposed soil boring locations and along the alignments to be used to access the boring locations;
- Clearing of vegetation as necessary around the GCPT boring locations and along the alignments to be used to reach each of the locations using a forestry mower and/or bulldozer;
- Placement of road base or gravel along the access alignments and around the GCPT boring locations to support vehicle access to each GCPT boring location;
- Clearing of vegetation as necessary, performance of overland gamma survey, and placement of gravel/road base as necessary to allow access to existing location PVC-38 (or others) and performance of downhole gamma logging of PVC-38 (or others) to calibrate the GCPT cesium iodide detector prior to performance of the GCPT investigation;
- Performance of GCPT testing at each boring location; and
- Final surveying of the actual GCPT boring locations.

With the exception of the calibration run(s), all of these activities are expected to be conducted outside of the estimated extent of the radiologically impacted material in Area 1 (Figure 2).

## 5 HAZARD EVALUATION AND CONTROLS

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There exists a limited potential for biological, physical, chemical, and radiological hazards during implementation of the GCPT investigation at the West Lake Landfill site. An activity-specific hazard analysis and control measures to mitigate the potential hazards are included in this section.

### 5.1 BIOLOGICAL HAZARDS

Possible biological hazards include venomous insects (e.g., bees, wasps, spiders) that can produce allergic reactions; plants such as poison ivy, oak, and sumac that elicit allergic skin reactions in sensitive individuals, and other invertebrates such as fire ants and biting flies which can produce painful irritations. Exposure to these hazards will be minimized with appropriate protective clothing.

### 5.2 PHYSICAL HAZARDS AND CONTROLS

Physical hazards that may be encountered include:

- |  |   |  |
|--|---|--|
| <input checked="" type="checkbox"/> Slip/trip/fall hazards | <input checked="" type="checkbox"/> Head hazards        | <input checked="" type="checkbox"/> Eye hazards        |
| <input checked="" type="checkbox"/> Thermal stresses       | <input checked="" type="checkbox"/> Foot hazards        | <input checked="" type="checkbox"/> Hand hazards       |
| <input checked="" type="checkbox"/> Mechanical hazards     | <input checked="" type="checkbox"/> Electrical hazards  | <input checked="" type="checkbox"/> Fire and explosion |
| <input checked="" type="checkbox"/> Falling objects        | <input checked="" type="checkbox"/> Heavy equip hazards | <input checked="" type="checkbox"/> Extreme weather    |
| <input checked="" type="checkbox"/> Excavation hazards     | <input checked="" type="checkbox"/> Material handling   | <input checked="" type="checkbox"/> High noise levels  |

Control measures for these physical hazards are provided in Table 2 and in Section 7.

### 5.3 CHEMICAL HAZARDS AND CONTROLS

#### 5.3.1 Fuel for Equipment

Fuel that will be used during the work activities include diesel fuel and gasoline. In addition to the information below regarding these chemicals, refer to the National Institute for Occupational Safety and Health (NIOSH) Guide to Chemical Hazards.



<u>Chemical Name</u>	<u>Concentration</u>	<u>Exposure Limits</u> <u>REL/PEL (8/10</u> <u>hr/day; 40 hr/ wk)</u>	<u>IDLH</u>	<u>MSDS if</u> <u>(available)</u>	<u>OSHA</u> <u>Carcinogen</u>	<u>Routes of</u> <u>Exposure *</u>
Diesel fuel	NA	300 ppm	900 ppm	Yes	Yes	Inh, Abs, con
Gasoline	NA	300 ppm	900 ppm	Yes	No	Inh, abs, con

NA – not applicable, REL – Recommended Exposure Limit, PEL – Permissible Exposure Limit, IDLH – Immediately Dangerous to Life & Health, ppm – parts per million, MSDS - material safety data sheet  
Routes of Exposure: Inh – Inhalation, Abs – Skin Absorption, Ing – Ingestion, Con – Contact (Skin / Eye)  
The Thirteen OSHA –Regulated Carcinogens are found in Appendix B, NIOSH Guide to Chemical Hazards

Material Safety Data Sheets (MSDSs) for diesel fuel and gasoline that include control measures for these fuels are provided in Appendix B.

### 5.3.2 Landfill Gases

In the unlikely event that landfill gas is encountered during advancement of the cone penetrometer (or drilling of borings, which will be conducted as a future activity), workers should be aware that landfill gas may contain methane, carbon monoxide, hydrogen, carbon dioxide, ammonia, organic compounds, and hydrogen sulfide. The potential fire or explosion hazards from common landfill gas components and health effects from oxygen deficient environments are listed below.

#### Potential Fire or Explosion Hazards from Common Landfill Gas Components

<u>Component</u>	<u>Potential to Pose a Fire or Explosion Hazard</u>
Methane	Methane is highly explosive when mixed with air at a volume between its Lower Explosive Limit (LEL) of 5 % and its Upper Explosive Limit (UEL) of 15%. At concentrations below 5% and above 15%, methane is not explosive.
Hydrogen	Hydrogen is highly explosive when mixed with air at a concentration between its LEL of 4 % and UEL of 74.5 %.
Carbon Monoxide	Carbon monoxide is explosive when mixed with air at a concentration between its LEL of 12.5 % and UEL of 57 %.
Carbon dioxide	Carbon dioxide is not flammable or explosive.
Nitrogen	Nitrogen is not flammable or explosive.
Oxygen	Oxygen is not flammable, but is necessary to support combustion.
Ammonia	Ammonia is flammable. Its LEL is 15% and its UEL is 28%. However, ammonia is unlikely to collect at a concentration high enough to pose an explosion hazard.
NMOCs	Potential explosion hazards vary by chemical. For example, the LEL of benzene is 1.2% and its UEL is 7.8%. However, benzene and other non-methane organic compounds (NMOCs) alone are unlikely to collect at concentrations high enough to pose explosion hazards.

Hydrogen sulfide	Hydrogen sulfide is flammable. Its LEL is 4% and its UEL is 44%. However, in most landfills, hydrogen sulfide is unlikely to collect at a concentration high enough to pose an explosion hazard.
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#### Health Effects from Oxygen-deficient Environments

<u>Oxygen Concentration</u>	<u>Health Effects</u>
21%	Normal ambient air oxygen concentration
17%	Deteriorated night vision (not noticeable until a normal oxygen concentration is restored), increased breathing volume, and accelerated heartbeat
14% to 16%	Increased breathing volume, accelerated heartbeat, very poor muscular coordination, rapid fatigue, and intermittent respiration
6% to 10%	Nausea, vomiting, inability to perform, and unconsciousness
Less than 6%	Breathing spasms, convulsive movements, and death in minutes

An on-site worker selected by the Project Health and Safety Officer will wear a personal 4-gas meter while conducting project activities. The meter will be capable of monitoring oxygen, explosive gas levels, carbon monoxide, and hydrogen sulfide. If monitoring detects explosive levels of landfill gas 18 inches to 2 feet above the waste surface, work will be halted until the gas dissipates and/or fans are applied to the work area to ensure the gas dissipates before reaching explosive concentrations.

#### 5.3.3 Hazardous Wastes

Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) might be encountered during advancement of the cone penetrometer (or drilling of borings, which will be conducted as a future activity). A hazard assessment of compounds of concern that might be encountered is provided in Table 3.

Regular monitoring for the presence of VOCs will be conducted by the Project Health and Safety Officer and changes made as necessary to the initial level (Level D; see Section 7.2) of skin and respiratory personal protective equipment (PPE). A photoionization detector (PID) with an 11.7 eV lamp will be used to monitor for VOCs in the breathing zone and the soil surface where the cone penetrometer is being advanced. If drilling of borings is conducted as a future activity, the borehole, any geological samples upon their retrieval, and drill cuttings will also be monitored with the PID. PID and multi-gas monitoring (see Section 5.3.2) will be conducted every 15 minutes for the first 2 hours of a specific activity and then at least every 120 minutes during active work.

To maintain safe working conditions, if vapor concentrations in the breathing zone consistently exceed 5 ppm (instrument gauge units) based on PID measurements, then an upgrade from initial Level D to Level C PPE will be made. Level C PPE will require the addition of a Tyvek suit, disposable nitrile gloves, and a National Institute of Occupational Safety and Health ("NIOSH") approved full-face respirator with organic vapor/acid gas cartridges and dust/mist pre-filters. All personnel performing work in Level C must be fit-tested and trained in the proper use of respirators.

#### 5.3.4 Asbestos

The inhalation of friable asbestos fibers by workers can cause disease of the lungs and other organs that may not appear until years after the exposure has occurred. In the event that friable asbestos is encountered during GCPT activities, the on-site personnel will have been appropriately trained regarding asbestos awareness and recognition. Appropriate personnel will be notified as to the location of confirmed or presumed asbestos containing materials. Any confirmed asbestos containing materials will be handled by personnel with appropriate training to handle such material. Documentation as to the handling procedures and disposition of the friable asbestos containing material will be maintained in the project files.

### 5.4 RADIOLOGICAL HAZARDS AND CONTROLS

#### 5.4.1 Radiological Hazards

All radiological hazards are associated with the radiologically-impacted soil within Area 1. The radionuclides are primarily comprised of isotopes of thorium and radium and their decay products. Potential exposures from working in and on top of radiologically-impacted soil include:

- External (Direct) Exposure. The radiologically-impacted soil on the surface will emit penetrating radiation in the form of gamma rays.
- Internal Exposure. Internal exposures occur when a worker ingests impacted soil or inhales dust containing radioactive particles.
- Spreading Contamination. It is likely that skin, clothing, and tools that contact radiologically-impacted surface soil within the extent of radiologically-impacted material in Areas 1 and 2 could become contaminated. The dose for such radiological contamination is likely to be very low. To prevent potentially contaminated materials from being carried to vehicles and off-site locations, the materials should be examined with a radiation ratemeter-scaler coupled to a pancake detector (e.g., Ludlum Model 44-9). The standard procedure for monitoring personnel and equipment for radioactive contamination is provided in Appendix C.

#### 5.4.2 Radiological Controls

The purpose of the radiological hazard controls is to lay out procedures that will avoid any significant exposure to the workers involved with the GCPT investigation. During the initial safety meeting, workers will be apprised of the radiological contamination hazard both in extent and degree. The controls to be used to mitigate the hazard will then be presented.

As a general approach, the surveyor will layout the proposed GCPT boring locations and alignments to be used to access the locations. Vegetation clearing will then be conducted along the alignments and around the GCPT boring locations. The Project Health and Safety Officer or Radiation Safety Officer will then walk the cleared alignment and boring locations with a scintillation detector, which measures gamma radiation, to identify any radiological anomalies. The road base/gravel will then be placed over the access alignments and the GCPT boring sites following which, the CPT investigation will be conducted.

There are two primary goals of the GCPT investigation. The first is to locate an alignment for the possible subsurface barrier that is outside of the extent of RIM in Area 1. The second is to locate an alignment as far to the north as possible due to the anticipated lower thickness of refuse the further north from the North Quarry Landfill and the resultant reduced complexity and time necessary for implementation of the subsurface barrier if such a barrier is determined to be necessary. Consequently, although the majority of the proposed GCPT boring location are planned to be located outside of the line where no RIM has previously been identified or is otherwise expected to be present (i.e., the line connecting soil borings that did not contain elevated levels of radionuclides or surface or downhole gamma readings), some of the GCPT borings may be drilled between this line and the interpolated line of the extent of RIM (i.e., the line connecting the midpoints between soil borings with no indications of RIM occurrences and soil borings within observed occurrences of RIM). Therefore, there is a possibility that some of the workers could traverse areas where radionuclides may be present in the surface or subsurface soil.

Because the surveyors, vegetation clearing personnel and gamma scan personnel may potentially enter the radiologically-impacted areas to complete their work, a potential risk exists for these workers for being exposed to radiation. Such exposures will be limited by limiting the amount to which these workers may intrude into the potential areas containing RIM, limiting the amount of time that these workers may be present within the possible areas of RIM, use of appropriate personnel protective equipment (e.g., boots, gloves, safety glasses, etc.) and adherence to the procedures set forth in this HSP in particular the frisking and decontamination procedures. These workers will be required to wear personal dosimetry while completing their work and will be issued a Thermoluminescent Detector (TLD) by the site Radiation Safety Officer. Each TLD will be assigned to a specific individual and can only be worn by that person. Dosimeters will be collected each night by the site Radiation Safety Officer or his delegate and reissued the following day. When a TLD is issued, the recipient will be briefed on the use and care of the dosimeter. Dosimeters shall be worn on the chest area, on or between the waist and the neck. Dosimeters

shall not be exposed to security x-ray devices, excessive heat, or medical sources of radiation. If a dosimeter is lost or damaged, the worker should immediately report the loss to the site Radiation Safety Officer. If the Radiation Safety Officer decides to issue Electronic Personal Dosimeters, they will be collected and read at the end of each shift. Results from Electronic Personal Dosimeters will be considered monitoring data. Doses of record will be determined from the TLDs.

Exposure by other workers is not likely to occur if the anticipated procedures described above to prepare and access the GCPT boring locations (i.e., placement of gravel) and the procedures and precautions delineated in this Health and Safety Plan are followed. It is important that all workers understand they may become exposed if they leave the gravel roads/drill pads and enter the area of RIM occurrences within Area 1 without training and appropriate health and safety equipment and procedures. If a worker suspects that they may have contacted surface soil in a radiologically-impacted area (e.g., soil collected on the bottom of work boots), the potentially contaminated area will be examined with a radiation ratemeter-scaler coupled to a pancake detector. If the scan indicates the collected soil is contaminated, the contaminated surface should be washed with water and the soil/water solution collected in a plastic container or bag.

## 6 TRAINING

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On-site workers will have received hazardous waste operations and emergency response (HAZWOPER) training in accordance with 29 CFR 1910.120. These workers will also have received the radiological safety training required in 10 CFR Part 19 which requires that “*..all individuals who, in the course of their employment, are likely to receive a dose of more than 100 millirem in a year, must receive adequate training to protect themselves against radiation.*”. This level of training will be conducted even though exposure, if any, for on-site workers is expected to be much less than 100 millirem.

The radiological safety training will meet typical General Employee Radiological Training (GERT) requirements and include:

- The nature of radioactive materials on the Site;
- Potential routes of exposure;
- Types of controls practiced to minimize exposures; including discussion of any engineering controls, administrative use of time, distance and shielding, and personal protective equipment;
- Types of monitoring used to track potential exposures (periodic area surveys, air monitoring, and use of dosimeters);
- Proper use of instrumentation;
- Incident reporting;
- Availability and use of confidential personal dosimetry records;
- Effects of radiation on humans; and
- Allowable limits (who sets them and what they are).

In addition, on-site workers will have been appropriately trained regarding asbestos awareness and recognition.

All personnel performing work described in this HSP must attend a site/project orientation session, conducted by an FEI representative. The session will cover, at a minimum, site restrictions, health and safety regulations, required personal protective equipment, potential site hazards, constituents of concern, decontamination and emergency procedures. All personnel attending the site/project orientation session must sign the Compliance Agreement provided in Appendix A of this HSP.

Visitors who stay at the site for less than one hour or subcontractors performing routine work not directly related to work described in this HSP (e.g., delivery of equipment and materials) will not require a health and safety orientation.

Each subcontractor must designate a qualified person to be responsible for the health and safety of their employees, and will cooperate with FEI in implementing this HSP.

## 7 GENERAL HEALTH AND SAFETY PROCEDURES

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This section presents general health safety procedures to be followed during the GCPT investigation activities. The measures contained herein will be supplemented as necessary with standard safe work practices.

### 7.1 ONSITE CONTROL

Onsite control at Areas 1 and 2 of the West Lake Landfill is currently provided by six-foot high chain-link security fences that surround Areas 1 and 2.

### 7.2 PERSONAL PROTECTIVE EQUIPMENT

The minimum level (Level D) of PPE required for the GCPT investigation will consist of the following:

- Steel-toed boots (mandatory),
- High visibility traffic vest or high visibility work shirt (mandatory);
- Hard hat (mandatory),
- Safety glasses (mandatory),
- Gloves, as necessary based on the specific activity, and
- Hearing protection, as necessary based on the specific activity.

Visitors shall be required to wear PPE equivalent to the above.

### 7.3 ENVIRONMENTAL MONITORING

If it is suspected that a worker or equipment has contacted soil within the radiologically-impacted areas within Area 1, monitoring of the contacted surface will be conducted with a radiation ratemeter-scaler coupled to a pancake detector by the On-site Health and Safety Officer.

### 7.4 COMMUNICATION

A cellular telephone will be carried by the On-site Health and Safety Officer at all times. The following standard hand signals will be used in the event that verbal communication becomes impossible:

<u>Hand Signal</u>	<u>Explanation</u>
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK, I am all right, I understand
Thumbs down	No, negative

## 7.5 SAFE WORK PRACTICES AND LIMITATIONS

Site Activities will be conducted during daylight hours only. The On-site Health and Safety Officer must provide permission for field work conducted beyond daylight hours or on weekends and holidays. The On-site Health and Safety Officer will review pertinent health and safety matters with onsite personnel in daily health and safety meetings. Additional work practices and limitations are listed as follows:

- All site personnel shall acknowledge in the Compliance Agreement (Appendix A) that they have read, understood, and agree to comply with the HSP.
- In addition to an initial health and safety meeting the project, daily health and safety may be conducted by the On-site Health and Safety Officer at the start of each work day to discuss the day's upcoming activities and to address the health and safety procedures to be followed.
- Applicable OSHA guidelines will be followed for all site activities.
- Dress in accordance with the activity-specific level of protection.
- Smoking will be prohibited except in designated areas.
- Any person under a physician's care, taking medication, or those who experience allergic reactions must inform the On-site Health and Safety Officer.
- If a single individual is working at the site, they must have a cellular phone on their person that is turned on.
- The wearing of contact lenses for onsite personnel is prohibited by best management practice and OSHA.
- Be aware of symptoms of heat or cold stress, exposure to hazardous chemicals or dangerous atmospheres, and work-related injuries. Standard Operating Procedures for Heat Stress are included in Appendix D.
- If trenching activities are conducted, proper excavation and trenching procedures must be followed as outlined in 29 CFR 1926.650 through .653 (Subpart P. Excavations,



Trenching, and Shoring). In particular, the requirements for shoring, sloping, and access/egress must be followed.

- In addition, all underground utilities (gas, electric, water, cable, telephone) at the site must be identified and marked prior to the commencement of any GCPT boring, excavation and/or trenching activity. None are expected to be present in Area 1
- Good personal hygiene practices are especially important when working in the proximity of the potential radiologically-impacted areas within Areas 1 and 2. Of particular importance is the need to keep fingers away from the face unless they have been carefully washed. Cuts and abrasions should be covered by a band-aid.
- All accidents and hazardous material exposure incidents will be reported on the appropriate forms, included in Appendix A.

## 7.6 HEAVY EQUIPMENT

Working around heavy equipment can be dangerous because of the size and power of the equipment, the limited operatory field of vision, and the noise levels that can be produced by the equipment. The following practices shall be followed by operators when using heavy equipment:

- Equipment should be inspected daily by the operator to ensure that the equipment is in safe operating condition.
- When not in use, hydraulic and pneumatic components should be left in down or "dead" position.
- Roll-over protection shall be provided on uneven terrain sites.
- No riding on vehicles or equipment except in fixed seats.
- Seat belts should be worn at all times.
- Backup alarms, automatically activated and loud enough to be heard above background noise, are required to be operational on all heavy equipment.
- Parking brakes should always be applied on parked equipment.
- Equipment should never be operated closer than 10 feet from utility lines.
- Windshields must be maintained, clean, and free of visual obstructions.

To ensure the safety of personnel in the work area, the following safety procedures regarding heavy equipment must be reviewed prior to and followed during work activities:

- Ensure that equipment operators are trained and/or experienced in the operation of the specific equipment.
- Personnel should never approach a piece of heavy equipment without the operators' acknowledgment and stoppage of work or yielding to the employee.
- Never walk under the load of a bucket or stand beside an opening truck bed.

- Maintain visual contact with the operator when in close proximity to the heavy equipment.
- Wear hearing protection while on or around heavy equipment, when normal conversation cannot be heard above work operations.
- Steel-toed shoes, safety glasses, and a hard hat shall be worn for all work conducted near heavy equipment.

## 7.7 HEAVY LIFTING

When lifting objects, use the following proper lifting techniques:

- Keep your feet shoulder width apart to get the best footing possible.
- Bend at the knees, not at the waist.
- Tighten stomach muscles to offset the force of the load.
- Grasp the object at opposite corners.
- Lift with the legs instead of the back muscles.
- Keep the back upright and avoid twisting.
- Most importantly, think before lifting.

## 7.8 SLIP/TRIP/HIT/FALL

Slip, trip, hit, and fall injuries are the most frequent of all injuries to workers. They occur for a wide variety of reasons, but can be minimized by the following prudent practices:

- Spot check the work area to identify hazards.
- Establish and utilize a pathway which is most free of slip and trip hazards.
- Beware of trip hazards such as wet floors, slippery floors, and uneven surfaces or terrain.
- Carry only loads which you can see over.
- Keep work areas clean and free of clutter, especially in storage rooms and walkways.
- Communicate hazards to on-site personnel.
- Secure all loose clothing, ties, and remove jewelry while around machinery.
- Report and/or remove hazards.
- Keep safe buffer zones between workers using equipment and tools.

## 7.9 ELECTRICAL HAZARDS

No individual shall be permitted to work on any part of an electrical power circuit unless the person is protected against electric shock by de-energizing the circuit and grounding it, or by locking and tagging it out:

- All electrical wiring and equipment shall be intrinsically safe for use in potentially explosive environments and atmospheres.
- All electrical wiring and equipment shall be a type listed by Underwriters' Laboratories (UL) or Factory Mutual (FM) for the specific application.
- All installations shall comply with the National Electric Code (NEC) and the National Electric Safety Code (NESC).
- All electrical circuits shall be grounded according to NEC and NESC Code. Ground fault circuit interrupters shall be used in the absence of properly grounded circuitry or when portable tools must be used around wet areas.
- All live wiring or equipment shall be guarded to protect all persons or objects from harm.

## 7.10 BIOLOGICAL HAZARDS

Biological hazards include tick-borne diseases and poisonous plants.

### 7.10.1 Tick-borne Diseases

Lyme disease is caused by a bacterial parasite called spirochete, and is spread by infected ticks that live in and near wooded areas, tall grass, and brush. Once the tick deposits the spirochete, it must feed on the host blood for 12 to 24 hours before it can transmit the disease. The ticks that cause the disease in the Northeast and Midwest are often no bigger than a poppy seed or a comma in a newsprint. The peak months for human infection are June through October. There are many other tick borne diseases such as Rocky Mountain Spotted Fever which can be carried by a variety of ticks. The prevention and treatment of these diseases are similar to those of Lyme disease.

#### 7.10.1.1 *Prevention.*

Ticks hang on blades of grass or shrubs waiting for a host to come by. When a host brushes against the vegetation, the tick grabs on. They typically climb onto an individual's legs and then crawl up looking to attach in a body crevice. Preventative measures include wearing light-colored clothing, keeping clothing buttoned, tucking pant legs into socks, pulling socks up past the knee, pulling the pant waist up above the naval area with a tight belt, and keeping shirt tails tucked in. Periodic checks for ticks should be made during the day, and especially at night. Hair should also be checked by parting it and combing through it to make sure that no ticks have attached to the scalp. Also, check clothing when it is first removed, before ticks have a chance to crawl off. It is common for ticks to be carried home on clothing and attach to others in the household.

The most common repellent recommended for ticks is N,N-dimethyl-m-toluamide, or DEET. It is important to follow the manufacturer's instructions found on the container for use with all insecticides especially those containing DEET. In general, DEET insect repellent should only be applied to clothing, not directly on the skin. Do not apply to sunburns, cuts or abrasions. Use soap and water to remove DEET once indoors.

#### *7.10.1.2 Removal.*

The best way to remove a tick is removal by tweezers. If tweezers are not available, cover your fingers (tissue paper) while grasping the tick. It is important to grasp the tick as close as possible to the site of attachment and use a firm steady pull to remove it. When removing the tick, be certain to remove all the mouth parts from your skin so as not to cause irritation or infection. Wash hands immediately after with soap and water, and apply antiseptic to the area where tick was removed.

#### *7.10.1.3 Testing and Symptoms of Lyme Disease.*

A variety of tests exist for determining Lyme Disease infection. However, most of these tests are not exact. The first symptoms of Lyme Disease usually appear from two days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick attached. The rash is often bull's eye-like with red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy". Unfortunately, this rash appears in only 60 to 80 percent of infected persons. An infected person also has flu-like symptoms of fever, fatigue, chills, headaches, a stiff neck, and muscle aches and pains (especially knees). Rashes may be found some distance away from the site of actual attachment. These symptoms often disappear after a few weeks.

#### *7.10.2 Poisonous Plants*

Common Poison Ivy (*Rhus radicans*) grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. Poison Sumac (*Rhus vernix*) grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction. This reaction is called contact dermatitis.

Dermatitis, in *Rhus*-sensitive persons, can result from contact with the milky sap found in the roots, stems, leaves, and fruit. The sap may retain its potency for months or years in a dry atmosphere, and can occur during any time of the year. The sap may also be carried by animals, equipment or apparel.

The best form of prevention is to avoid contact. This can occur by wearing long sleeves and gloves if necessary. Disposable clothing, such as Tyvek, is recommended in high risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

### 7.10.3 Fire Prevention

All flammable and/or combustible liquids (i.e., gasoline) will be stored in approved safety containers that meet the specifications of National Fire Protection Association (NFPA) Code 30 and OSHA 29 CFR 1910.106(a)(29). Smoking or open flames are not permitted within 20 feet of any flammable liquid container.

All personnel performing work must be trained in the proper use of fire extinguishers. OSHA-approved, portable fire extinguishers will be located in every field vehicle. These extinguishers are rated for Class A (wood, paper), B (flammable liquid), and C (electrical) fires, and their locations are clearly identified with signs and/or labels. As required by 29 CFR 1910.157(d), at least one fire extinguisher with the appropriate rating must be located within 75 feet of a class A fire hazard and 50 feet of a Class B or C fire hazard.

### 7.11 AUTHORIZED PROJECT FIELD PERSONNEL

Only authorized project personnel will be granted access to active work areas during field activities. Authorized personnel may include designated representatives from FEI, subcontractors, Republic Services, the U.S. Environmental Protection Agency, and the Missouri Department of Natural Resources. A Log Book will be maintained onsite to record the personnel performing work at or visiting the Site.

### 7.12 RECORD KEEPING AND REPORTING

The following records and/or logs will be maintained in the field vehicle of the On-site Health and Safety Officer and will be available for inspection:

- This Health and Safety Plan;
- A Log Book that documents all personnel entering and exiting the Site;
- Accident Report Forms that document any accidents and/or injuries at the Site, including corrective actions; and
- Material Safety Data Sheets that provide health and safety and emergency response information on all chemicals and materials used at the site.

All accidents (including vehicular accidents while traveling to/from the Site), injuries, illnesses, chemical exposures, fires, and/or deviations from the HSP will be reported to the On-site Health and Safety Officer and Project Manager. The On-site Health and Safety Officer must complete an Accident Report Form for all accidents or injuries occurring at the Site. The accident or injury must be reported to the Project Manager and appropriate actions taken.

## 8 EMERGENCY CONTACTS, PROCEDURES AND CONTINGENCY PLAN

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This section includes the telephone numbers for emergency contacts and the procedures to be implemented in the event of an emergency.

### 8.1 EMERGENCY CONTACTS

In the event of an emergency related to field activities, notification of the appropriate contacts listed on Table 3 should be made.

### 8.2 HOSPITAL ROUTE

Should the need for emergency medical care arise, the closest medical facility is:

SSM DePaul Health Center  
12303 DePaul Drive  
St. Louis, MO 63044-2588

A hospital route map is included as Figure 3. Travel time to the hospital from the West Lake Landfill site is approximately 7 minutes. The direct route to SSM DePaul Health Center is as follows:

- Exit the landfill and head SE on St Charles Rock Road (MO 180) toward Taussig Ave;
- Turn Right at Mareschal Lane;
- Take a slight Left at DePaul Circle; and
- Turn Left to stay on DePaul Drive to the SSM DePaul Health Center.

### 8.3 STANDARD EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. The On-site Health and Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

#### 8.3.1.1 *Pre Emergency Planning*

The provisions of this section of the HSP will be discussed with onsite field personnel during the health and safety orientation meeting.

#### 8.3.1.2 *Personnel Injury in the Work Zone*

Upon noticing any apparent serious injury, all work must be halted. The On-site Health and Safety Officer should evaluate the nature of the injury. If the accident is deemed serious (i.e., bodily harm has occurred), an ambulance should be requested as the first action item.

#### 8.3.1.3 *Fire/Explosion*

Proper storage of gasoline and other flammable liquids should be maintained to prevent or avoid spreading of a fire. Upon notification of a fire or explosion onsite, all site personnel should assemble at a designated meeting place and follow the directions below in Sections 8.7 and 8.8.

#### 8.3.1.4 *Other Equipment Failure*

If any other equipment fails to operate properly, the On-site Health and Safety Officer will be notified to evaluate the effect of this failure on continuing operations onsite. If the failure affects the safety of personnel or prevents completion of the work activities, all personnel will leave the work zone until the situation is evaluated and appropriate actions taken.

#### 8.3.1.5 *Site Re-entry*

In all situations when an onsite emergency results in evacuation of the work zone, personnel will not re-enter until any of the following conditions have been met, as appropriate:

- The conditions resulting in the emergency have been corrected.
- The hazards have been reassessed by the On-site Health and Safety Officer or a person designated by him.
- The HSP has been reviewed and revised, if necessary.
- Site personnel have been briefed on any changes in the HSP.

### 8.4 LOCATION OF SITE RESOURCES

The following items will be maintained in the field vehicle of the On-site Health and Safety Officer used to support each field activity:

- A cellular telephone;
- A copy of this HSP;
- A Log Book;
- Monitoring instrument manuals,
- A copy of the hospital route map and emergency contact list;
- Fire extinguisher;
- Safety supplies, and
- Any other item deemed necessary for personnel health and safety.

### 8.5 RESPONSE SEQUENCE FOR FIRST ARRIVALS

If you are the first on the scene, respond as follows:

- Evacuate the incident area (if necessary). Remember that your safety must be the primary consideration;

- Restrict access to the incident area;
- Restrict the use of ignition sources for incidents involving flammable substances;
- Call the On-site Health and Safety Officer or the local emergency response organization. Report the following information:
  - Your name
  - Company affiliation
  - Telephone number from which you are calling
  - Location and type of incident
  - Injuries, if any, and the number and type of injuries
  - Details concerning the substances(s) involved (identification, amount, spill rate, size of area involved), if known
  - If a spill, the direction the spill is moving and the direction the wind may be dispersing airborne contaminants
  - Surficial material on which the spill occurred (i.e., asphalt, gravel, etc.)
  - Any first response action that has been taken
  - The time the incident occurred or when you discovered it
  - Any additional pertinent information
- Notify the On-site Health and Safety Officer after the emergency response team has been contacted; and
- Coordinate with emergency response personnel when they arrive.

## 8.6 EMERGENCY RESPONSE FOR SEVERE WEATHER CONDITIONS

The Environmental Manager for Republic Services shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, strong winds, and tornados are examples of conditions that would call for the discontinuation of work and evacuation of the site. No work will be permitted during any type of electrical storm. This section specifies what should be done in the event of a severe weather emergency, including electrical storms, high winds, heavy rain or hail, and tornados.

### 8.6.1 Electrical Storms

The procedures include the following:

- Seek shelter in the field vehicles;
- Do not stand near or under high objects.

### 8.6.2 High Winds

The procedures include the following:

- Seek shelter at the field vehicles;
- Do not drive high profile vehicles at high speeds;



- Park vehicles heading into the wind; and
- Wear safety goggles and a kerchief or dustmask covering your nose and mouth.

#### 8.6.3 Heavy Rain or Hail

The procedures include the following:

- Seek shelter in the field vehicles; and
- Do not attempt to drive a vehicle if you are in an area that is or has the potential for flooding unless you are moving out of a low area.

#### 8.6.4 Tornados

The procedures include the following:

- Seek shelter underground or in a closet, bathroom, or interior wall of a substantial building. Get under something sturdy and cover your head;
- Do not stay in a trailer or vehicle. Leave the trailer or vehicle and lie flat in the nearest ditch if substantial shelter is not available;
- Stay away from large areas of glass; and
- Stay away from large unsupported roofs.

### 8.7 EMERGENCY RESPONSE FOR FIRES

If a small fire occurs, extinguish it with the fire extinguisher in the field vehicle. Remember to follow these directions to put out the fire:

- Aim at the base of the flame;
- Use the appropriate type of fire extinguisher; and
- Remember that the spray only lasts a few seconds.

If a large fire occurs at the Site, follow these instructions:

- Move flammable and combustible items out of the path of the fire, if such action can be performed safely;
- Call the Fire Department and report the information outlined in Section 8.5;
- Do not attempt to put out a large fire with the field vehicle fire extinguisher;
- Report the incident to the On-site Health and Safety Officer and Project Manager.

### 8.8 EMERGENCY RESPONSE FOR EXPLOSIONS

If an explosion occurs, follow these instructions:

- Evacuate the site immediately;

- If feasible, decontaminate yourself and others;
- Do not address medical emergencies until you are out of danger;
- Call the On-site Health and Safety Officer or local emergency response organization when you are out of danger to report the incident. Report the information outlined in Section 8.5.

## Tables

Table 1 - Project Safety Personnel and Contact Information

Title	Company	Name	Mobile Telephone
Project Manager	FEI	Dan Feezor	(217) 836-8842
Project Health and Safety Officer	FEI	Paul Eastvold	(217) 691-6836
Project Radiation Safety Officer	Auxier & Associates	Mike Bollenbacher	(865) 414-0378
On-site Health and Safety Officer	ConeTech	Rob Coates	(780) 908-1872
Environmental Manager (EM)	Republic Services	Brian Power	(618) 410-0157

**Table 2 – Hazard and Control Matrix**

<b>Task</b>	<b>Potential Hazard</b>	<b>Control Measures</b>
Driving Safety	<ul style="list-style-type: none"> <li>• Vehicle traffic</li> <li>• Off-road Hazards (stationary objects, uneven terrain, etc)</li> <li>• Exposure to unfamiliar vehicle, streets, and/or directions</li> <li>• Changes in weather or traffic conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect car and maps before driving</li> <li>• Adjust mirrors and seat positions</li> <li>• Make sure luggage, supplies are secure</li> <li>• Wear seatbelt</li> <li>• Pull over to talk on cell phone</li> <li>• Listen to weather and traffic reports before leaving</li> </ul>
Mobilize/Demobilize Equipment to Jobsite	<ul style="list-style-type: none"> <li>• Insecure loads</li> <li>• Unsafe lifts</li> <li>• Blind spots</li> </ul>	<ul style="list-style-type: none"> <li>• Check load straps and chains after loading and before moving truck</li> <li>• Use spotter when backing vehicles or equipment</li> <li>• Notify workers in the area of planned equipment placement</li> <li>• Have workers move out of path if necessary when spotting equipment</li> <li>• Make eye contact and exchange signals with operator when moving near load</li> <li>• Use level, dry area to unload &amp; store equipment and materials</li> <li>• PPE – Modified Level D, no coveralls required.</li> </ul>
General Construction	<ul style="list-style-type: none"> <li>• Caught between pinch points</li> <li>• Incorrect lifting techniques</li> <li>• Overexertion</li> <li>• Fall, same level</li> <li>• Heat Stress</li> </ul>	<ul style="list-style-type: none"> <li>• Use work gloves if pinch points could be a factor in unloading and loading supplies</li> <li>• Use proper bending/lifting techniques-use your legs, not your back</li> <li>• Ask for help if something is too heavy or uncomfortable to lift alone</li> <li>• Look before you step</li> <li>• Inspect ties for integrity</li> <li>• Take necessary breaks</li> <li>• Consume adequate amounts of fluids</li> <li>• Access pickup beds from the rear of the truck only</li> <li>• Do not jump into or out of pickup beds</li> <li>• PPE – Modified Level D, no coveralls required.</li> </ul>

**Table 2 – Hazard and Control Matrix (cont.)**

<b>Task</b>	<b>Potential Hazard</b>	<b>Control Measures</b>
General Construction, continued	<ul style="list-style-type: none"> <li>Slipping and Tripping Hazards</li> </ul>	<ul style="list-style-type: none"> <li>Travel directly to and from permitted work areas</li> <li>Walking paths to be kept free of tripping hazards</li> <li>Extension cords and hoses should be placed together and marked to increase awareness</li> <li>Care to be taken when walking, especially on wet surfaces.</li> <li>Use three point contact when getting on or off the equipment</li> <li>Move equipment to dryer grounds if surface is muddy or has standing water</li> </ul>
	<ul style="list-style-type: none"> <li>High Noise Levels</li> </ul>	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work periods) or when ever you must raise your voice for others to hear. (Double hearing protection when <math>\geq 90</math> dba)</li> </ul>
	<ul style="list-style-type: none"> <li>Struck by/Against Heavy Equipment</li> </ul>	<ul style="list-style-type: none"> <li>Wear reflective warning vests when exposed to vehicular traffic.</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment.</li> <li>Understand and review hand signals</li> <li>Warning vests, hard hat, safety glasses and steel toe work boots.</li> </ul>
	<ul style="list-style-type: none"> <li>Use of Hand Tools</li> </ul>	<ul style="list-style-type: none"> <li>All tools should be inspected prior to use</li> <li>No damaged equipment should be used until repaired or replaced.</li> <li>Damaged equipment must be tagged and taken out of service</li> <li>Use the proper tool for the task</li> <li>Know how to use tools safely</li> <li>Utilize non spark tools around flammable chemicals</li> </ul>

**Table 2 – Hazard and Control Matrix (cont.)**

<b>Task</b>	<b>Potential Hazard</b>	<b>Control Measures</b>
General Construction, continued	<ul style="list-style-type: none"> <li>Fueling of Vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Put vehicle in park or neutral with parking brake set</li> <li>Turn off engine and remove key from ignition</li> <li>Smoking is prohibited within 50 feet of fueling operations</li> <li>Never leave the nozzle unattended.</li> <li>Do not overfill vehicle tank or container</li> <li>Never use a cell phone or other personal electronic device while refueling.</li> <li>Upon exiting vehicle always touch a metal part of the vehicle away from the fill point before handling the nozzle to prevent static discharges.</li> </ul>
	<ul style="list-style-type: none"> <li>Placing Fuel in Portable Containers</li> </ul>	<ul style="list-style-type: none"> <li>Use only UL approved portable container with vapor -tight cap</li> <li>When filling container, follow same rules as when fueling car: turn off engine; extinguish smoking materials, etc....</li> <li>Place portable fuel container on the ground during filling, and keep the metal nozzle spout in contact with the container to prevent build up and discharge of static electricity. Never fill a container in the bed of a pickup, in the back of a station wagon, or in the trunk of a car.</li> <li>Manually control the nozzle valve throughout the filling process. Fill a portable container slowly to decrease the chance of static electricity buildup and minimize spilling or splattering.</li> <li>Seal contain tightly before loading into vehicle</li> <li>Secure container in an upright position to prevent sliding or tipping.</li> </ul>
	<ul style="list-style-type: none"> <li>Horseplay</li> </ul>	<ul style="list-style-type: none"> <li>Prohibit horseplay anywhere on jobsite</li> <li>Review rules about horseplay with workers</li> <li>Remind workers not to respond/participate in horseplay started by others</li> </ul>
	<ul style="list-style-type: none"> <li>Chemical Exposure</li> </ul>	<ul style="list-style-type: none"> <li>Avoid inhalation of vapors from fuel</li> <li>Wash skin with soap and cool water if fuel contacts skin.</li> </ul>

**Table 2 – Hazard and Control Matrix (cont.)**

<b>Task</b>	<b>Potential Hazard</b>	<b>Control Measures</b>
General Construction, continued	<ul style="list-style-type: none"> <li>• Radiologically-impacted Areas 1 and 2</li> </ul>	<p>Untrained workers may not enter radiologically restricted area except during rescue operations. No other access to this area is allowed for any reason.</p> <p>Additional precautions for untrained workers working outside the radiologically restricted area include:</p> <ul style="list-style-type: none"> <li>• Wear gloves when disturbing or handling soil</li> <li>• No eating, drinking, smoking or using smokeless tobacco products within 50 feet of proposed fence line</li> <li>• Radiation workers may enter with proper preparation and monitoring.</li> </ul>
Weather Conditions	<ul style="list-style-type: none"> <li>• Evaluate prevailing weather conditions for the Site.</li> <li>• Contingency plans developed for likely severe weather conditions such as tornado, and extreme thunderstorm.</li> <li>• Provide for daily weather forecast service in extreme weather areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Employees trained in contingency plan for severe weather conditions.</li> <li>• Weather service contacted regularly during storm conditions.</li> <li>• Supervisory personnel cease operations during extreme storm conditions, personnel evacuate to safe assembly area.</li> </ul>
	<ul style="list-style-type: none"> <li>• Heat Stress</li> <li>• Rain</li> </ul>	<ul style="list-style-type: none"> <li>• Workers are encouraged to increase fluid intake while working.</li> <li>• Workers will increase the frequency and duration of rest breaks while working in heat stress situations.</li> <li>• Workers will watch each other for signs and symptoms of heat exhaustion, fatigue.</li> <li>• If necessary, contractors will plan work in heat stress situations for early morning or evening during hot months.</li> <li>• Implement heat stress control program when necessary</li> <li>• Have proper rain gear available (i.e. Slickers, rubber boots, etc.)</li> </ul>



**Table 2 – Hazard and Control Matrix (cont.)**

Task	Potential Hazard	Control Measures
Biological	<ul style="list-style-type: none"> <li>• Injuries associated with insects, snakes, spiders and poisonous plants</li> </ul>	<ul style="list-style-type: none"> <li>• Be alert for signs of snakes, insect nests, ant hills and poisonous plants when walking.</li> <li>• Use extreme caution when moving or lifting objects that could be used by snakes or spiders as cover. Always wear leather gloves.</li> <li>• Never reach under or behind objects, or into other areas where snakes may hide.</li> <li>• Workers will tuck pants into socks and wear long sleeves and sturdy leather boots when walking in tall grass to protect against bio hazards.</li> <li>• Workers will use insect repellent when necessary.</li> <li>• Workers will use buddy system to check for signs of insect and spider bites, such as redness, swelling, and flu-like symptoms.</li> <li>• Workers will remove ticks immediately with fine tipped tweezers by grasping the tick as close to your skin as possible and gently pulling straight out. Do not squeeze the tick's body as this may inject fluids into you. Wash the bite area of skin and apply antiseptic.</li> <li>• Workers will immediately wash any areas that were exposed to poisonous plants.</li> <li>• Be aware that oil from poisonous plants can be carried on boots.</li> </ul>

Table 3 - Hazard Assessment for Selected Constituents

Constituent	CAS No.	TLV (ppm)	STEL (ppm)	Toxic Route of Exposure	CARC	Comments
Methylene chloride	75-09-2	50	--	Vapor inhalation, skin absorption of liquid	CSH Nonflammable; colorless; odorless; can't smell at <300 ppm	
Tetrachloroethene	127-18-4	25	100	Vapor inhalation, skin absorption of liquid	CSH Nonflammable; colorless; odorless; can't smell at <300 ppm	
Toluene	108-88-3	50	150	Vapor inhalation, skin absorption of liquid	No Flammable; colorless; sweet odor at <10 ppm	
Xylenes	1330-20-7 (o-xylene)	100	150	Vapor inhalation, skin absorption of liquid	No Flammable; colorless; sweet odor at <10 ppm	
1,2-Dichloroethene	540-59-0	200	--	Vapor inhalation	No Acrid odor	
1,2-Dichloroethane	107-06-2	1	2	Vapor inhalation, skin absorption of liquid	CSH Flammable; colorless; sweet odor at <10 ppm	
Trichloroethene	79-01-6	50	100	Inhalation, skin absorption	CSA Nonflammable; colorless; odorless; can't smell at <300 ppm	
1,1-Dichloroethane	75-34-3	100	250	Vapor inhalation	No Vapor	
Chloroform	67-66-3	10	2*	Vapor inhalation	CSH Flammable; colorless; sweet odor at <10 ppm	
Vinyl chloride	75-01-4	1	5	Vapor inhalation	CH No data	
Acetone	67-64-1	250	1,000	Vapor inhalation, skin absorption of liquid	No Flammable; sweet odor	
1,1,2-Trichloroethane	79-00-5	10	--	Vapor inhalation, skin absorption of liquid	CSH Combustible; colorless; sweet odor	
Trans 1,2-DCE	540-59-0	200		Vapor inhalation, skin absorption of liquid	CSH Flammable; colorless; pleasant odor	
Cis 1,2-DCE	540-59-0	200		Vapor inhalation, skin absorption of liquid	CSH Flammable; colorless; pleasant odor	
1,1,1,-TCA	71-55-6	350		Irritant to eyes and tissue	No Nonflammable; colorless	
Carbon tetrachloride	56-23-5	5		Vapor inhalation, skin absorption of liquid	CSH Noncombustible; colorless; sweetish odor	
Methyl ethyl ketone	78-93-3	200		Vapor inhalation	No Flammable; colorless; acetone-like odor	
Vinyl acetate	108-05-4	10		Vapor inhalation, skin absorption of liquid	No Flammable; colorless	
Isopropyl alcohol	67-63-0	400		Vapor inhalation, skin absorption of liquid	No Flammable; colorless; pleasant odor	
Chromium	7440-47-3	0.5 mg/m <sup>3</sup>		Inhalation; hexavalent chromium carcinogenic and corrosive on tissue	CH	

Notes: CAS No. = Chemical Abstracts Service Number

TLV = Threshold Limit Value; STEL = Short Term Exposure Limit

CARC = Carcinogenicity; CSH = Carcinogenicity suspected for humans; CH = Carcinogenicity established for humans; No = No definite carcinogenicity established.

ppm = parts per million; ug/m<sup>3</sup> and mg/m<sup>3</sup> = micrograms and milligrams per cubic meter, respectively.

-- = not listed in reference source.

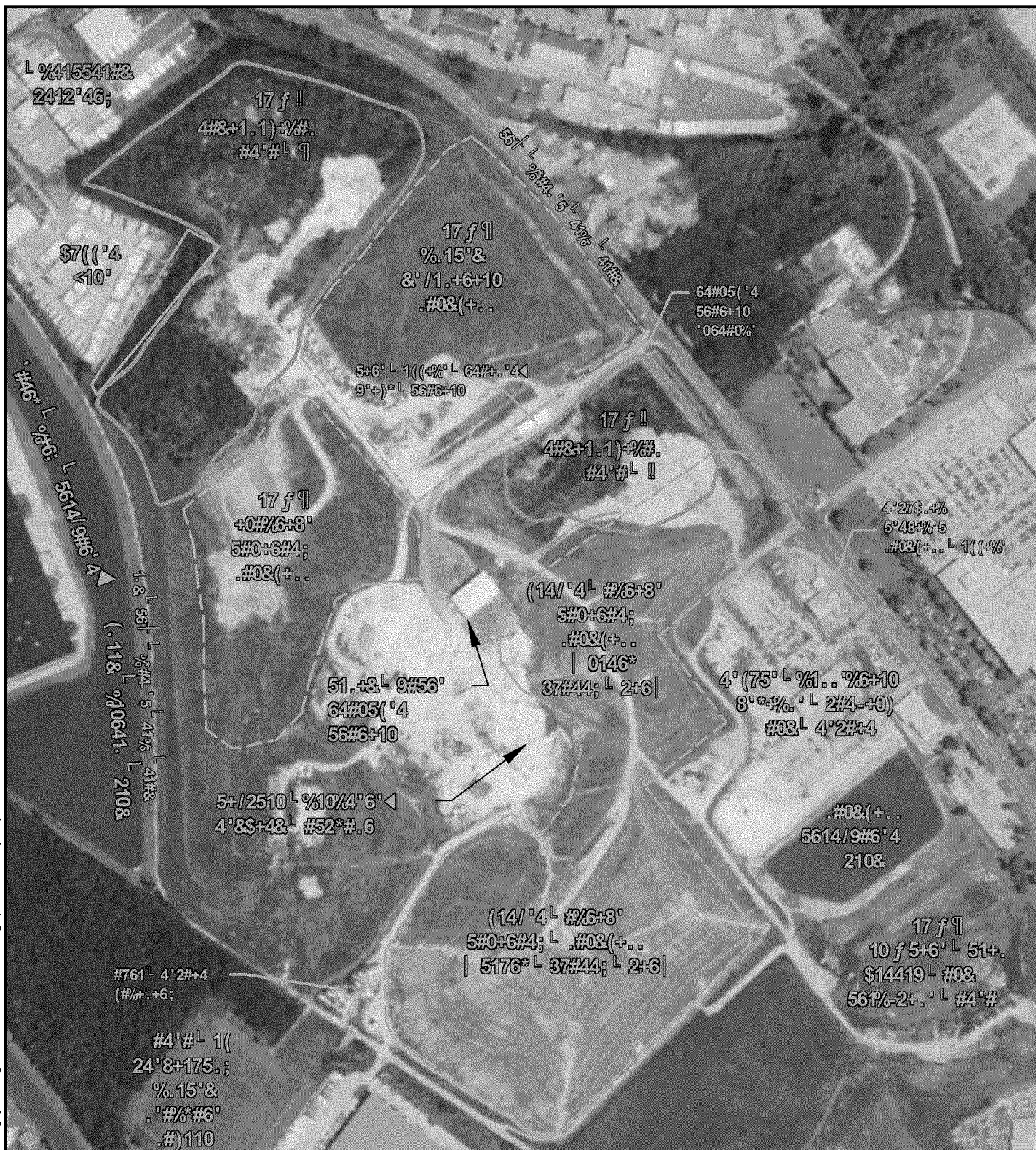
\* NIOSH (based on 60 minute exposure).

\*\* According to 29 CFR 1910.1017, no employee may be exposed to vinyl chloride at a concentration greater than 5 ppm averaged over any period not exceeding 15 minutes, or 1 ppm over an 8-hour workday.

Table 4 - List of Emergency Telephone Contacts

<u>Agency/Facility</u>	<u>Telephone No.</u>	<u>Contact</u>
Police (Bridgeton Police Department)	911 Emergency (314) 739-7557 non-emergency	
Fire Department (Pattonville Fire Protection District)	911 Emergency (314) 291-6072 non-emergency	
Ambulance (Robertson Fire Protection District)	911	
Emergency Medical Facility/Hospital	(314) 344-6000	SSM DePaul Health Center 12303 DePaul Drive St. Louis, MO 63044-2588
Poison Control Center (Chemtrec)	(800) 424-9300	
Republic Services (On-site Representative and Environmental Manager)	(618) 410-0157 cell (314) 744-8165 office	Brian Power
Feezor Engineering, Inc.	(217) 836-8842 cell (217) 483-3118 office	Dan Feezor
Auxier & Associates (Radiological Health, Safety, and Risk Assessment)	(865) 414-0378 cell	Mike Bollenbacher
ConeTech (GCPT borings)	(780) 908-1872 cell	Rob Coates

# Figures



Source: MyTopo.com Date of Photograph 8/9/2007

0 600  
SCALE IN FEET



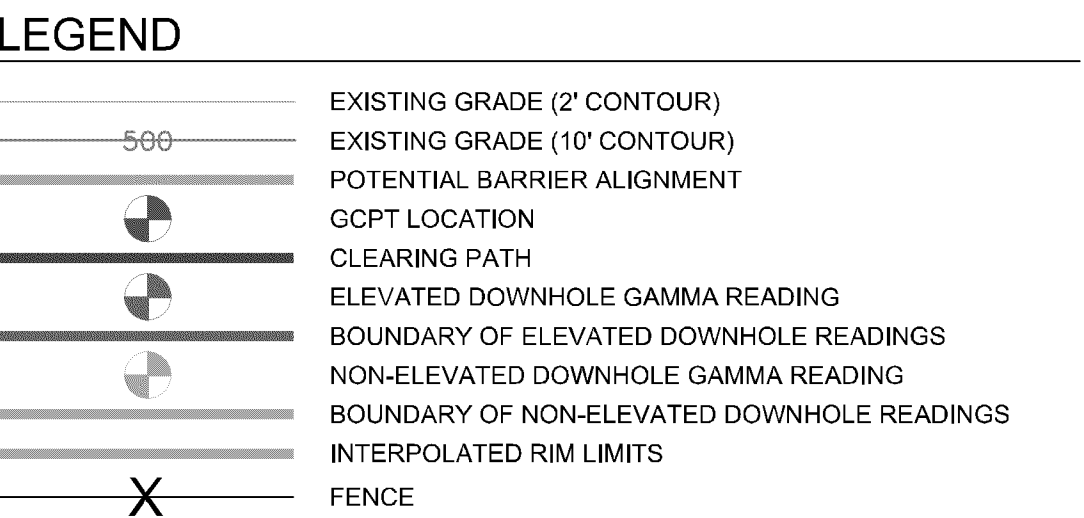
Figure 1

## West Lake Landfill Features

West Lake Landfill OU-1 Additional Fencing and Signage

EMSI Engineering Management Support, Inc.

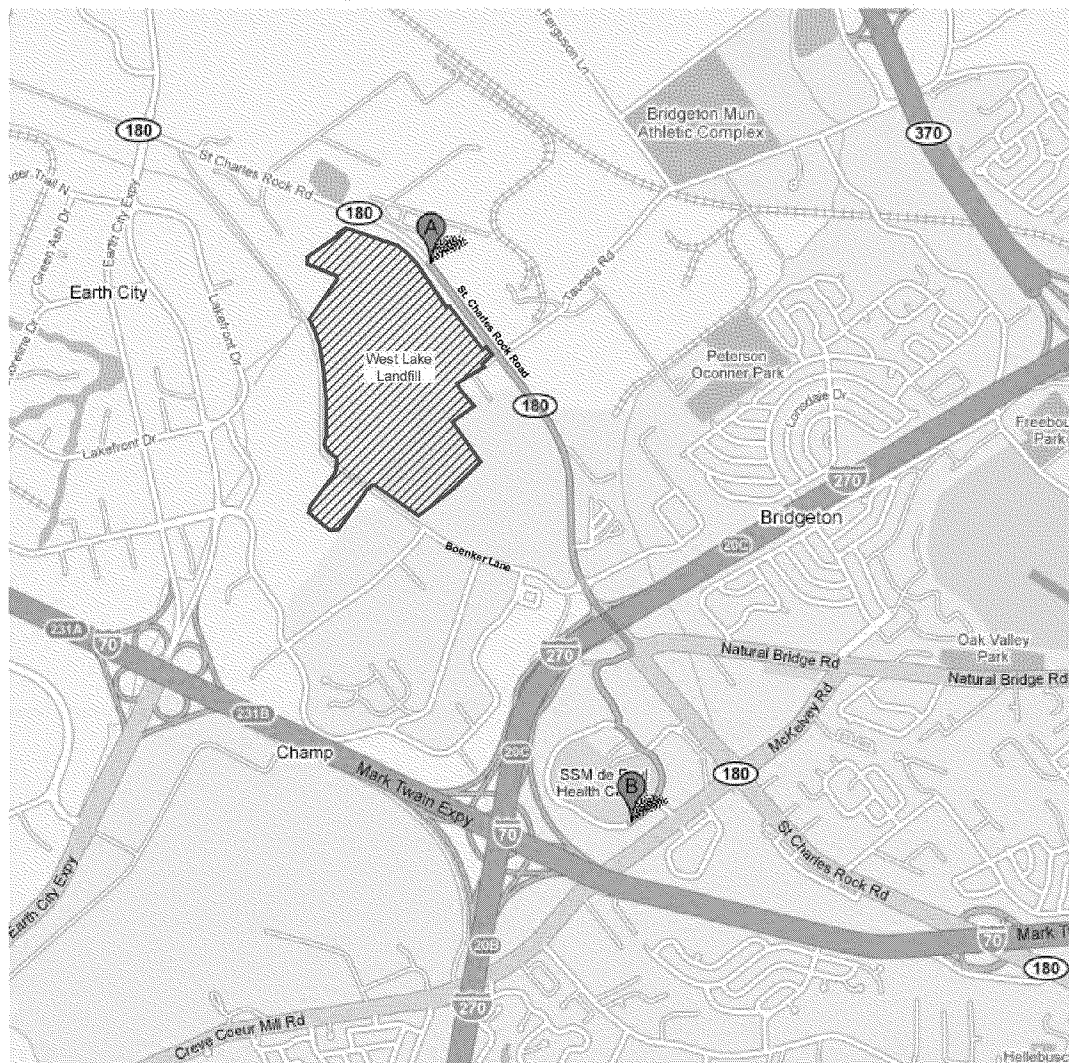












Directions to 12303 De Paul Dr,  
Bridgeton, MO 63044  
2.1 mi – about 7 mins



**13570 St Charles Rock Rd**  
**Bridgeton, MO 63044**

- |   |                           |
|---|---------------------------|
|  1. Head southeast on MO-180/St Charles Rock Rd toward Taussig Ave | go 1.3 mi<br>total 1.3 mi |
| About 5 mins  |                           |
|  2. Turn right at Mareschal Ln                                     | go 0.1 mi<br>total 1.5 mi |
|  3. Slight left at De Paul Dr                                      | go 0.2 mi<br>total 1.7 mi |
|  4. Turn left to stay on De Paul Dr                                | go 0.4 mi<br>total 2.1 mi |
| Destination will be on the right  |                           |
| About 2 mins  |                           |

**12303 De Paul Dr**  
**Bridgeton, MO 63044**

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2008 Tele Atlas

NOT TO SCALE



Figure 3

## Directions to Hospital from West Lake Landfill

West Lake Landfill OU-1 Additional Fencing and Signage

EMSI Engineering Management Support, Inc.

## **Appendix A:**

### **Forms/Logs**



## Health and Safety Compliance Agreement

I have read, understand, and agree to comply with the health and safety procedures in this Health and Safety Plan (HSP). In addition, I have attended, understand, and agree to comply with the information presented in the health and safety pre-activity meeting. I hereby agree that (1) compliance with the HSP is a condition of entry to the site, and (2) non-compliance with the HSP may result in work stoppage and/or dismissal from the Site.

Printed Name

## Organization

**Signature**

Date

[illegible]

Personnel health and safety pre-activity meeting conducted by:

Name

## Organization

**Signature**

Date \_\_\_\_\_

## Accident/Incident Report

Date \_\_\_\_\_ Project Location \_\_\_\_\_

Description of accident/incident, including injuries, property damage, emergency action taken and personnel involved (use additional sheets if needed):

[illegible]

Witnesses of Accident/Incident:

---

---

---

Possible or known causes:

---

---

What actions are needed to prevent a similar incident?

---

---

---

Reporter

On-site Health and Safety Officer

---

Project Manager

## **Appendix B:**

# **Material Safety Data Sheets**



# Safety Data Sheet

**Material Name: Diesel Fuel, All Types**

**SDS No. 9909**  
US GHS

**Synonyms:** Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

## \*\*\* Section 1 - Product and Company Identification \*\*\*

### Manufacturer Information

Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS  
Emergency # 800-424-9300 CHEMTREC  
[www.hess.com](http://www.hess.com) (Environment, Health, Safety Internet Website)

## \*\*\* Section 2 - Hazards Identification \*\*\*

### GHS Classification:

Flammable Liquids - Category 3  
Skin Corrosion/Irritation – Category 2  
Germ Cell Mutagenicity – Category 2  
Carcinogenicity - Category 2  
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)  
Aspiration Hazard – Category 1  
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

### GHS LABEL ELEMENTS

#### Symbol(s)



#### Signal Word

DANGER

#### Hazard Statements

Flammable liquid and vapor.  
Causes skin irritation.  
Suspected of causing genetic defects.  
Suspected of causing cancer.  
May cause respiratory irritation.  
May cause drowsiness or dizziness.  
May be fatal if swallowed and enters airways.  
Harmful to aquatic life.

#### Precautionary Statements

##### Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking  
Keep container tightly closed.  
Ground/bond container and receiving equipment.

# Safety Data Sheet

**Material Name: Diesel Fuel, All Types**

**SDS No. 9909**

Use explosion-proof electrical/ventilating/lighting/equipment.  
Use only non-sparking tools.  
Take precautionary measures against static discharge.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Wash hands and forearms thoroughly after handling.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Avoid breathing fume/mist/vapours/spray.

## Response

In case of fire: Use water spray, fog or foam to extinguish.  
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.  
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.  
IF exposed or concerned: Get medical advice/attention.

## Storage

Store in a well-ventilated place. Keep cool.  
Keep container tightly closed.  
Store locked up.

## Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

## \*\*\* Section 3 - Composition / Information on Ingredients \*\*\*

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

## \*\*\* Section 4 - First Aid Measures \*\*\*

### First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

### First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

### First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

## \* \* \* Section 5 - Fire Fighting Measures \* \* \*

### General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

### Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

### Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

### Unsuitable Extinguishing Media

None

### Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

## \* \* \* Section 6 - Accidental Release Measures \* \* \*

### Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

### Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

### Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

## Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

## Prevention of Secondary Hazards

None

## \* \* \* Section 7 - Handling and Storage \* \* \*

### Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

### Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

### Incompatibilities

Keep away from strong oxidizers.

## \* \* \* Section 8 - Exposure Controls / Personal Protection \* \* \*

### Component Exposure Limits

#### Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)  
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Naphthalene (91-20-3)

ACGIH: 10 ppm TWA  
15 ppm STEL  
Skin - potential significant contribution to overall exposure by the cutaneous route  
OSHA: 10 ppm TWA; 50 mg/m3 TWA  
NIOSH: 10 ppm TWA; 50 mg/m3 TWA  
15 ppm STEL; 75 mg/m3 STEL

## Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

## Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

## Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

## Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

## Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

## \*\*\* Section 9 - Physical & Chemical Properties \*\*\*

<b>Appearance:</b>	Clear, straw-yellow.	<b>Odor:</b>	Mild, petroleum distillate odor
<b>Physical State:</b>	Liquid	<b>pH:</b>	ND
<b>Vapor Pressure:</b>	0.009 psia @ 70 °F (21 °C)	<b>Vapor Density:</b>	>1.0
<b>Boiling Point:</b>	320 to 690 °F (160 to 366 °C)	<b>Melting Point:</b>	ND
<b>Solubility (H2O):</b>	Negligible	<b>Specific Gravity:</b>	0.83-0.876 @ 60°F (16°C)
<b>Evaporation Rate:</b>	Slow; varies with conditions	<b>VOC:</b>	ND
<b>Percent Volatile:</b>	100%	<b>Octanol/H2O Coeff.:</b>	ND
<b>Flash Point:</b>	>125 °F (>52 °C) minimum	<b>Flash Point Method:</b>	PMCC
<b>Upper Flammability Limit (UFL):</b>	7.5	<b>Lower Flammability Limit (LFL):</b>	0.6
<b>Burning Rate:</b>	ND	<b>Auto Ignition:</b>	494°F (257°C)

## \*\*\* Section 10 - Chemical Stability & Reactivity Information \*\*\*

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.



# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

## Incompatible Products

Keep away from strong oxidizers.

## Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

## \* \* \* Section 11 - Toxicological Information \* \* \*

### Acute Toxicity

#### A: General Product Information

Harmful if swallowed.

#### B: Component Analysis - LD50/LC50

##### Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m<sup>3</sup> 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

### Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

### Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

### Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

### Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

### Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

### Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

### Carcinogenicity

#### A: General Product Information

Suspected of causing cancer.

# Safety Data Sheet

**Material Name: Diesel Fuel, All Types**

**SDS No. 9909**

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

## B: Component Carcinogenicity

### Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

### Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)

IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

## Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

## Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

## Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

## Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

## \* \* \* Section 12 - Ecological Information \* \* \*

## Ecotoxicity

### A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

### B: Component Analysis - Ecotoxicity - Aquatic Toxicity

#### Fuels, diesel, no. 2 (68476-34-6)

##### Test & Species

96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]
--------------------------------	------------------------

##### Conditions

#### Naphthalene (91-20-3)

##### Test & Species

96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]

##### Conditions

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

## Persistence/Degradability

No information available.

## Bioaccumulation

No information available.

## Mobility in Soil

No information available.

## \*\*\* Section 13 - Disposal Considerations \*\*\*

### Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

### Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

## \*\*\* Section 14 - Transportation Information \*\*\*

### DOT Information

Shipping Name: Diesel Fuel

NA #: 1993 Hazard Class: 3 Packing Group: III

Placard:



## \*\*\* Section 15 - Regulatory Information \*\*\*

### Regulatory Information

#### Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

#### Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

#### SARA Section 311/312 – Hazard Classes

Acute Health  
X

Chronic Health  
X

Fire  
X

Sudden Release of Pressure  
--

Reactive  
--

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

## State Regulations

### Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

### Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

### Additional Regulatory Information

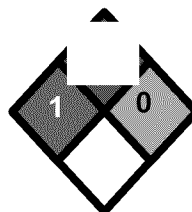
### Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

## \* \* \* Section 16 - Other Information \* \* \*

**NFPA® Hazard Rating**

Health	1
Fire	2
Reactivity	0



**HMIS® Hazard Rating**

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal

\*Chronic

# Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909

## Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

## Literature References

None

## Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

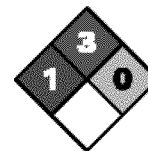
Gasoline, All Grades

MSDS No. 9950

### EMERGENCY OVERVIEW

#### DANGER!

**EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT  
- EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF  
SWALLOWED - ASPIRATION HAZARD**



NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

### 1. CHEMICAL PRODUCT and COMPANY INFORMATION

(rev. Jan-04)

Amerada Hess Corporation  
1 Hess Plaza  
Woodbridge, NJ 07095-0961

**EMERGENCY TELEPHONE NUMBER (24 hrs):**

**COMPANY CONTACT (business hours):**

**MSDS Internet Website**

**CHEMTREC (800)424-9300**

Corporate Safety (732)750-6000

[www.hess.com/about/envIRON.html](http://www.hess.com/about/envIRON.html)

**SYNONYMS:** Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

### 2. COMPOSITION and INFORMATION ON INGREDIENTS \*

(rev. Jan-04)

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

### 3. HAZARDS IDENTIFICATION (rev. Dec-97)

#### **EYES**

Moderate irritant. Contact with liquid or vapor may cause irritation.

#### **SKIN**

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

#### **INGESTION**

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

#### **INHALATION**

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

**WARNING:** the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

#### **CHRONIC EFFECTS and CARCINOGENICITY**

Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

#### **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE**

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

### 4. FIRST AID MEASURES (rev. Dec-97)

#### **EYES**

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

#### **SKIN**

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

#### **INGESTION**

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

#### **INHALATION**

Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

### 5. FIRE FIGHTING MEASURES (rev. Dec-97)

#### **FLAMMABLE PROPERTIES:**

FLASH POINT: -45 °F (-43°C)  
AUTOIGNITION TEMPERATURE: highly variable; > 530 °F (>280 °C)  
OSHA/NFPA FLAMMABILITY CLASS: 1A (flammable liquid)  
LOWER EXPLOSIVE LIMIT (%): 1.4%  
UPPER EXPLOSIVE LIMIT (%): 7.6%

#### **FIRE AND EXPLOSION HAZARDS**

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

#### **EXTINGUISHING MEDIA**

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO<sub>2</sub>, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 "Low Expansion Foam - 1994 Edition."

#### **FIRE FIGHTING INSTRUCTIONS**

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

### 6. ACCIDENTAL RELEASE MEASURES (rev. Dec-97)

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product



# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

**Gasoline, All Grades**

**MSDS No. 9950**

vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

### 7. HANDLING and STORAGE (rev. Dec-97)

#### HANDLING PRECAUTIONS

\*\*\*\*\*USE ONLY AS A MOTOR FUEL\*\*\*\*\*

\*\*\*\*\*DO NOT SIPHON BY MOUTH\*\*\*\*\*

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

#### STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

#### WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

### 8. EXPOSURE CONTROLS and PERSONAL PROTECTION (rev. Jan-04)

#### EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
Gasoline (86290-81-5)	ACGIH	300	500	A3	
Benzene (71-43-2)	OSHA	1	5	Carcinogen	
	ACGIH	0.5	2.5	A1, skin	
	USCG	1	5		
n-Butane (106-97-8)	ACGIH	800	--	2003 NOIC: 1000 ppm (TWA) Aliphatic Hydrocarbon Gases Alkane (C1-C4)	
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--		
	ACGIH	1000	--	A4	
Ethyl benzene (100-41-4)	OSHA	100	--		
	ACGIH	100	125	A3	

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## MATERIAL SAFETY DATA SHEET

**Gasoline, All Grades**

**MSDS No. 9950**

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits	Note
n-Hexane (110-54-3)	OSHA	500	--		
	ACGIH	50	--	skin	
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3	
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established	
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)	
	ACGIH	50	--	A4 (skin)	
1,2,4-Trimethylbenzene (95-63-6)	ACGIH	25	--		
Xylene, mixed isomers (1330-20-7)	OSHA	100	--		
	ACGIH	100	150	A4	

### ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

### EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

### SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

### RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

## 9. PHYSICAL and CHEMICAL PROPERTIES (rev. Jan-04)

### APPEARANCE

A translucent, straw-colored or light yellow liquid

### ODOR

A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

### ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

### BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 °F (39 to 200 °C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H <sub>2</sub> O = 1):	0.70 - 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

**Gasoline, All Grades**

**MSDS No. 9950**

SOLUBILITY (H<sub>2</sub>O):

Non-oxygenated gasoline - negligible (< 0.1% @ 77 °F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 °F); ethanol is readily soluble in water

### 10. STABILITY and REACTIVITY (rev. Dec-94)

**STABILITY:** Stable. Hazardous polymerization will not occur.

#### **CONDITIONS TO AVOID**

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

#### **INCOMPATIBLE MATERIALS**

Keep away from strong oxidizers.

#### **HAZARDOUS DECOMPOSITION PRODUCTS**

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

### 11. TOXICOLOGICAL PROPERTIES (rev. Dec-97)

#### **ACUTE TOXICITY**

Acute Dermal LD50 (rabbits): > 5 ml/kg

Acute Oral LD50 (rat): 18.75 ml/kg

Primary dermal irritation (rabbits): slightly irritating

Draize eye irritation (rabbits): non-irritating

Guinea pig sensitization: negative

#### **CHRONIC EFFECTS AND CARCINOGENICITY**

Carcinogenicity: OSHA: NO

IARC: YES - 2B

NTP: NO

ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

### 12. ECOLOGICAL INFORMATION (rev. Jan-04)

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API ([www.api.org](http://www.api.org)) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

### 13. DISPOSAL CONSIDERATIONS (rev. Dec-97)

Consult federal, state and local waste regulations to determine appropriate disposal options.

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

**Gasoline, All Grades**

**MSDS No. 9950**

### 14. TRANSPORTATION INFORMATION (rev. Jan-04)

DOT PROPER SHIPPING NAME: Gasoline  
 DOT HAZARD CLASS and PACKING GROUP: 3, PG II  
 DOT IDENTIFICATION NUMBER: UN 1203  
 DOT SHIPPING LABEL: FLAMMABLE LIQUID

PLACARD:



### 15. REGULATORY INFORMATION (rev. Jan-04)

#### U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

#### CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

#### CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

#### SARA SECTION 311/312 - HAZARD CLASSES

<u>ACUTE HEALTH</u>	<u>CHRONIC HEALTH</u>	<u>FIRE</u>	<u>SUDDEN RELEASE OF PRESSURE</u>	<u>REACTIVE</u>
X	X	X	--	--

#### SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents ([www.epa.gov/tri](http://www.epa.gov/tri)) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

# AMERADA HESS CORPORATION

## MATERIAL SAFETY DATA SHEET

**Gasoline, All Grades**

**MSDS No. 9950**

### CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)

Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

### **16. OTHER INFORMATION (rev. Jan-04)**

**NFPA® HAZARD RATING**

HEALTH:	1	Slight
FIRE:	3	Serious
REACTIVITY:	0	Minimal

**HMIS® HAZARD RATING**

HEALTH:	1 *	Slight
FIRE:	3	Serious
REACTIVITY:	0	Minimal

\* CHRONIC

**SUPERSEDES MSDS DATED:** 12/30/97

### **ABBREVIATIONS:**

AP = Approximately      < = Less than      > = Greater than  
N/A = Not Applicable      N/D = Not Determined      ppm = parts per million

### **ACRONYMS:**

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
AIHA	American Industrial Hygiene Association	OPA	Oil Pollution Act of 1990
ANSI	American National Standards Institute (212)642-4900	OSHA	U.S. Occupational Safety & Health Administration
API	American Petroleum Institute (202)682-8000	PEL	Permissible Exposure Limit (OSHA)
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act	RCRA	Resource Conservation and Recovery Act
DOT	U.S. Department of Transportation [General Info: (800)467-4922]	REL	Recommended Exposure Limit (NIOSH)
EPA	U.S. Environmental Protection Agency	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
HMIS	Hazardous Materials Information System	SCBA	Self-Contained Breathing Apparatus
IARC	International Agency For Research On Cancer	SPCC	Spill Prevention, Control, and Countermeasures
MSHA	Mine Safety and Health Administration	STEL	Short-Term Exposure Limit (generally 15 minutes)
NFPA	National Fire Protection Association (617)770-3000	TLV	Threshold Limit Value (ACGIH)
NIOSH	National Institute of Occupational Safety and Health	TSCA	Toxic Substances Control Act
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	TWA	Time Weighted Average (8 hr.)
		WEEL	Workplace Environmental Exposure Level (AIHA)
		WHMIS	Workplace Hazardous Materials Information System (Canada)

### **DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

**Appendix C:**  
**Standard Procedure for Monitoring for**  
**Radioactive Contamination**

## **PROCEDURE 2.7**

### **MONITORING PERSONNEL AND EQUIPMENT FOR RADIOACTIVE CONTAMINATION**

#### **1.0 PURPOSE**

- 1.1 To describe the general approach for monitoring personnel and equipment for radioactive contamination.

#### **2.0 RESPONSIBILITIES**

- 2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.
- 2.2 Survey team members are responsible for following this procedure.

#### **3.0 PROCEDURE**

- 3.1 Upon exiting potentially contaminated areas, monitoring of clothing and exposed skin surfaces will be performed. Equipment and materials will also be monitored and shown to be free of contamination before release for use without radiological restrictions or controls.
- 3.2 Equipment
- 3.2.1 Ratemeter-scaler: Model 3 or Model 2221, Ludlum Measurements, Inc.; or equivalent, equipped with audible speaker or headphones.
- 3.2.2 Detector: Selected detectors are indicated below. Equivalent detectors are also acceptable.

Activity	Detector Type	Model
Alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	Gas proportional	Ludlum 43-68, Ludlum 239-1
Beta	Gas proportional	Ludlum 43-68, Ludlum 239-1
	Geiger-Mueller	Ludlum 44-9, Eberline HP-260

3.2.3 Instrument cables

3.2.4 Check sources

3.2.5 Record Forms and/or field logbook

3.3 Quality Control Check

Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and source responses following Procedure 2.1.

3.4 Surface Scanning

3.4.1 Headphones or other audible signal operating modes are used for scanning.

3.4.2 Set the instrument response for "FAST", response where possible.

3.4.3 Pass the detector slowly over the surface. The detector should be kept as close to the surface as conditions allow. The speed of detector movement will vary depending upon the radionuclide of concern and the experience of the surveyor. While scanning for alpha or beta activity, the detector is typically moved about one detector width per second.

3.4.3 Note increases in count rate as indicated by the audible meter output. Identifiable increases in the audible response suggest possible contamination and should be resurveyed at a slower rate to confirm findings.

3.5 Personnel Monitoring

3.5.1 When monitoring for skin or clothing contamination, give particular attention to the hands, shoes, pant and shirt cuffs, knees, and other surfaces which have a high likelihood of contamination.

3.5.2 If there is detectable contamination, it should be removed as directed by the Health and Safety Committee (HSC) Chairperson. Decontamination guidance will be provided in the Survey Work Plan. The Site Safety Officer will implement decontamination or other contamination control actions at the project site.

3.6 Equipment Monitoring



- 3.6.1 For equipment surveys, attention should be given to monitoring cracks, openings, joints, and other areas where contamination might accumulate.
  - 3.6.2 Measure levels of total and removable surface contamination (see Procedures 2.3 and 3.6) at locations of elevated direct radiation identified by the scan and at additional representative surface locations.
  - 3.6.3 Acceptable surface contamination levels will be established on a project-specific basis, with details, including decontamination instructions, provided in the Survey Work Plan.
- 3.7 Document results of contamination surveys in field records

## **PROCEDURE 2.3 DIRECT RADIATION MEASUREMENT**

### **1.0 PURPOSE**

- 1.1 To describe the method for measuring total alpha and beta radiation levels on equipment and building surfaces.

### **2.0 RESPONSIBILITIES**

- 2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.
- 2.2 Survey team members are responsible for following this procedure.

### **3.0 PROCEDURE**

#### **3.1 Equipment**

- 3.1.1 Ratemeter-scaler: Model 3, Model 2220 or 2221, Ludlum Instrument Corporation; or equivalent
- 3.1.2 Detector: Selected detectors are listed below: Equivalent detectors are also acceptable

Activity	Detector Type	Model
alpha	ZnS scintillator	Ludlum 43-1 or 43-5, Eberline AC3-7 or AC3-8
	gas proportional	Ludlum 43-68
beta	Geiger-Mueller	Ludlum 44-9, Eberline HP-260
	gas proportional	Ludlum 43-68

- 3.1.3 Cables
- 3.1.4 Check source
- 3.1.5 Record forms

### 3.2 Quality Control Check

- 3.2.1 Assemble instrument, turn on, check battery, and adjust high voltage and threshold, if necessary. Check background and check source responses. Follow the procedures described in Procedure 2.1.

### 3.3 Direct Measurement

- 3.3.1 When applicable, team members performing instrument checks will calculate the average and maximum "field action levels" for instrument combination based on the specific site criteria and background.

$$\text{Action level (cpm)} = [\text{site criteria (dpm/100 cm}^2\text{)} \times E \times G \times T] + B$$

T = count time (minutes)

E = operating efficiency (counts/disintegration)

G = geometry (total detector area (cm<sup>2</sup>)/100)

	Total Area	Active Area
43-5 detector area =	80 cm <sup>2</sup>	60 cm <sup>2</sup>
43-1 detector area =	80 cm <sup>2</sup>	50 cm <sup>2</sup>
43-68 detector area =	126 cm <sup>2</sup>	100 cm <sup>2</sup>
44-9 detector area =	20 cm <sup>2</sup>	15.5 cm <sup>2</sup>
HP-260 detector area =	20 cm <sup>2</sup>	15.5 cm <sup>2</sup>

B = background (cpm)

A field count at or above this value indicates that further investigation in this location is necessary.

NOTE: For a particular site, the action level may be established as any activity exceeding background.

- 3.3.2 Select an appropriate counting time. A counting time is desired which will achieve a minimum detectable activity (see Procedure 4.2) value less than 50% of the applicable criteria. For most radionuclides a 1-minute count, using the instruments listed above, is adequate to achieve this sensitivity. For radionuclides having guidelines of 5000 dpm/100 cm<sup>2</sup>, average and 15,000 dpm/100 cm<sup>2</sup>, maximum, 0.5 minute counting times may be acceptable.

- 3.3.3 Place the detector face in contact with the surface to be surveyed. The detector face is typically constructed of a very thin and fragile material, so care must be exercised to avoid damage by rough surfaces or sharp objects. (Scans should have been performed, prior to this point, to identify representative locations and locations of elevated direct surface radiation for measurement.)
- 3.3.4 Set the meter timer switch, press the count-reset button, and accumulate the count events until the meter display indicates that the count cycle is complete.
- 3.3.5 Record the count and time on the appropriate record form.
- 3.3.6 If the location has a surface activity level above background, the area around the measurement locations should be scanned to determine the homogeneity of the measured activity level in the area. Dimensions and activity levels of inhomogeneities should be documented on the appropriate record form.
- 3.3.7 The surface activity may be calculated according to Procedure 4.3.

## **PROCEDURE 3.6 REMOVABLE ACTIVITY SAMPLING**

### **1.0 PURPOSE**

- 1.1 To provide guidelines for measuring removable alpha and beta radioactivity on equipment and building surfaces.

### **2.0 RESPONSIBILITIES**

- 2.1 The Site Survey Manager is responsible for assuring this procedure is implemented.
- 2.2 Survey team members are responsible for following this procedure.

### **3.0 PROCEDURE**

#### 3.1 Equipment and Materials

- 3.1.1 Smears, Mazlin wipes, filter papers (like Whatman 47 mm dia. glass fiber) or equivalent
- 3.1.2 Glassine or paper envelopes
- 3.1.3 Record forms
- 3.1.4 Counting equipment

#### 3.2 Sample Collection

NOTE: Direct measurements will be completed before a smear sample is taken.

- 3.2.1 Grasp the smear (filter) paper by the edge, between the thumb and index finger.
- 3.2.2 Applying moderate pressure with two or three fingers, wipe the numbered side of the paper over approximately 100 cm<sup>2</sup> of the surface.
- 3.2.3 Place the filter in an envelope.

- 3.2.4. Record the smear number, site, date, location of the smear, and name of sample collector on the envelope.
- 3.2.5 Label and secure in accordance with Procedures 3.7 and 3.8. Record pertinent information on the Chain-of-Custody Form.
- 3.2.6 If the direct measurement was elevated, the smear should be monitored (procedures 2.2 and 2.3) to determine whether contaminated material was transferred to the smear. If an activity level greater than 250 cpm is detected, the smear envelope should be marked as such.

NOTE: Smears having activity levels greater than 2500 cpm should be counted using field instrumentation. Decisions regarding further analyses and method of disposal of contaminated smears will be made by the PM and SSM on a case-by-case basis.

### 3.3 Field Sample Measurement

- 3.3.1 If the object of the survey is to determine if radon or thoron daughter products or other short half-life radionuclides are present, the smears should be counted within 1-2 hours before significant decay of short-lived radionuclides has occurred.
- 3.3.2 If necessary, smears can be counted in the field using portable instrumentation (see Procedure 2.3).
- 3.3.3 Record count and counting time data on the appropriate record form.
- 3.3.4 Subtract the background count (determined by counting blank or unused smear) and convert net count to dpm/100 cm<sup>2</sup>, using proper time and detector efficiency values.

$$\frac{DPM}{100 CM^2} = \frac{NETCOUNT}{TIME(MIN) * EFFICIENCY * \frac{COUNT}{DISINTEGRATION} * OTHERMODIFYINGFACTORS}$$

## **Appendix D:**

# **Understanding and Preventing Heat Stress**

# UNDERSTANDING AND PREVENTING HEAT STRESS





## HEAT STRESS: IT'S A MATTER OF DEGREE



Under certain conditions, your body may have trouble regulating its temperature. As a result, your body overheats and suffers from some degree of heat stress. Whether mild, moderate, or severe, heat stress can come on suddenly and be dangerous to your health. But if you're prepared, you can "keep your cool" and prevent heat-related problems.

### When It's Too Hot for You to Handle

Hard work or play can overload your body with extra heat—especially if you're active in a hot, humid, or poorly ventilated environment. These conditions make it harder for your body to handle heat—the sweat pours out, you don't feel well or work well, and you may feel dizzy or faint. If these signs of heat stress go unrecognized and untreated, serious—and sometimes permanent—health problems can occur.

### Keep Your Cool

Our bodies vary in their ability to handle heat. But everyone can learn to avoid the adverse health and safety effects of heat stress. Keep your cool by knowing your body and its limitations, by understanding heat stress, and by preventing heat stress in the first place.



### Know Your Body

Your body has a "heat regulator" that controls body temperature. But activity, heat, humidity, or lack of air movement can overwork this mechanism.

### Understand Heat Stress

Protect yourself from heat stress. Learn to recognize warning signs—such as heavy sweating, fatigue, and dizziness—and know how heat stress is treated.

### Prevent Heat Stress

Take an active role to prevent heat problems. Know the factors that increase your risk and take steps to reduce them, such as drinking water and acclimatizing to the heat.

This booklet is not intended to replace your company's health and safety policies or professional medical care.

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## HOW YOUR BODY HANDLES HEAT

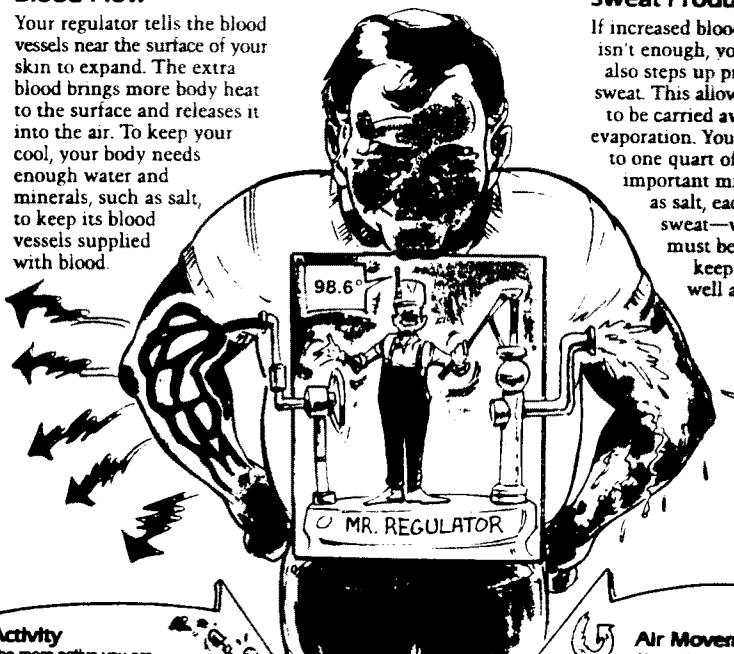
You have a natural mechanism that regulates the **core temperature** deep inside your body. You maintain a normal core temperature of 98.6° F by releasing excess heat into the air. The heat leaves your body through the blood vessels near the skin's surface and through the evaporation of sweat. Your level of activity and certain environmental conditions make the regulator work harder to increase your body's blood flow and sweat production.

### Blood Flow

Your regulator tells the blood vessels near the surface of your skin to expand. The extra blood brings more body heat to the surface and releases it into the air. To keep your cool, your body needs enough water and minerals, such as salt, to keep its blood vessels supplied with blood.

### Sweat Production

If increased blood flow alone isn't enough, your regulator also steps up production of sweat. This allows more heat to be carried away through evaporation. You can lose up to one quart of water, plus important minerals such as salt, each hour you sweat—water which must be replaced to keep you feeling well and healthy.



### Activity

The more active you are, the more heat your muscles generate. Heavy physical activity also sets up competition between your muscles and skin for the blood supply.

### Environmental Temperature

As the temperature in your environment goes up, so does your body temperature. When it's hot from the sun or other radiant heat sources, such as a furnace, your body can't transfer heat to the air as effectively.

### Humidity

The higher the humidity, the less sweat evaporates. That's because the moisture content in the air is already high, making it difficult for the air to absorb more moisture.

### Air Movement

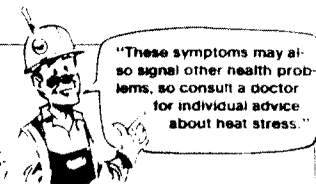
Air moving across your skin carries away heat from its surface; it also helps sweat evaporate. But with little air movement, these processes don't work as well.

"When these conditions prevent me from regulating your body's temperature, you're in danger of having heat stress."

## UNDERSTAND HEAT STRESS

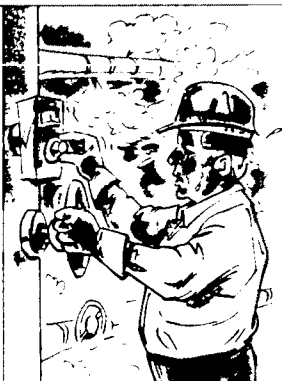
When your body's heat regulator is pushed too far and your body overheats, some form of heat stress occurs. It may be mild, moderate, or severe; symptoms may range from excessive sweating to dizziness to

unconsciousness. Since even severe heat stress can appear suddenly, learn the warning signs and how they're treated, so you can be more comfortable and productive, and prevent heat problems from occurring.



### ☐ Mild: Minor Heat Problems

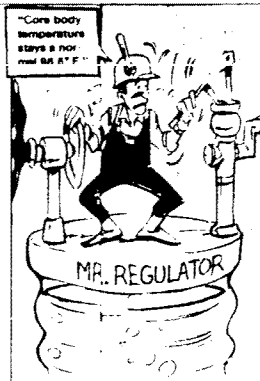
This is usually the earliest and least serious form of heat stress. Mild heat stress is always reversible and usually isn't dangerous unless the symptoms persist. Although you usually can continue work soon after treatment, always inform your supervisor if you have symptoms of mild heat stress.



#### Signs and Symptoms

You may have one or more of these symptoms.

- Excessive sweating
- Painful spasms in muscles during or several hours after activity (heat cramps).
- Tiny red bumps on skin and a prickling sensation (called prickly heat).
- Irritability, mild dizziness, or weakness.



#### What's Going On

Sweating causes your body to lose too much water and minerals. This imbalance may cause muscles to cramp. Your sweat glands may become blocked and inflamed, causing a rash. Too little blood flowing to the brain causes irritability, dizziness and other symptoms.

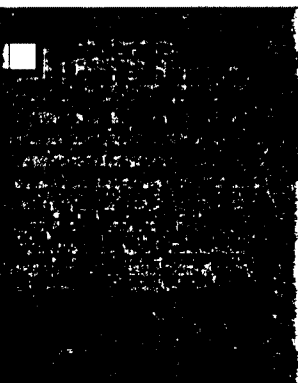


#### Treatment

Follow this self-care:

- Rest in a cool or shady area.
- Drink water or other fluids.
- Use warm, moist compresses over cramping muscles, followed by gentle massage.
- Use a mild drying lotion to relieve the rash; keep skin dry and clean.

Taking additional salt is usually **not** necessary.



#### Signs and Symptoms

You may have one or more of these symptoms.

- Excessive sweating.
- Cold, moist, pale skin (or flushed skin).
- Thirst.
- Extreme weakness or fatigue.
- Headache, nausea, or loss of appetite.
- Dizziness or giddiness.
- A rapid, weak pulse.



#### What's Going On

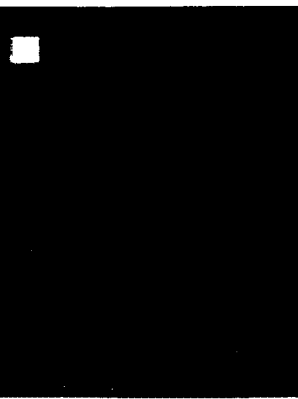
Losing too much water and minerals reduces the blood supply to major organs, such as the brain, muscles, and skin. Your heart works harder to maintain the blood supply, straining your cardiovascular system. Some organs, such as the brain, may not get enough blood.



#### Treatment

You may need medical treatment, as well as this self-care:

- Rest in a cool or shady area.
- Drink water or other fluids.
- Take additional salt only if advised.
- Use cool compresses on forehead, around the neck, and under armpits.



#### Signs and Symptoms

You may have one or more of these symptoms.

- Lack of sweating.
- Hot, dry, flushed skin.
- Deep, rapid breathing.
- A rapid, weak, and possibly irregular pulse.
- Headache, nausea, or delirium.
- Loss of consciousness.
- Convulsions.



#### What's Going On

Your regulator becomes so overburdened that blood flow and sweat cannot cool your body enough. Your body becomes so overheated that sweat glands and other organs don't function normally. This can affect vital organs, including your heart and brain, and may cause permanent damage.



#### Treatment

Call for medical help right away. While waiting for medical treatment, begin first aid:

- Rest in a cool or shady area.
- Remove outer clothing.
- Lower body temperature with cool compresses, increasing air movement, or both.
- Drink water or other fluids (if conscious).

## CHECKPOINTS FOR PREVENTING HEAT STRESS

"Don't wait until you're thirsty to have a drink of water—thirst is not a good indicator of how much water your body needs."



There are several steps you and your employer can take to prevent heat stress. Both supervisors and employees can recognize risks and follow safety

procedures to reduce them. Be sure to inform your employer about any medical conditions you have and discuss whether you might be at increased risk.

"If you're physically fit, you may acclimatize up to 50% faster."



### ✓ Know Your Environment

Your company controls the work environment so it's safe. You can help by knowing which factors increase your risk of heat stress. Talk with your supervisor about ways to reduce them, so you can take special precautions to protect yourself when the risk is especially high, such as on hot, humid days.

### ✓ Drink Plenty of Water

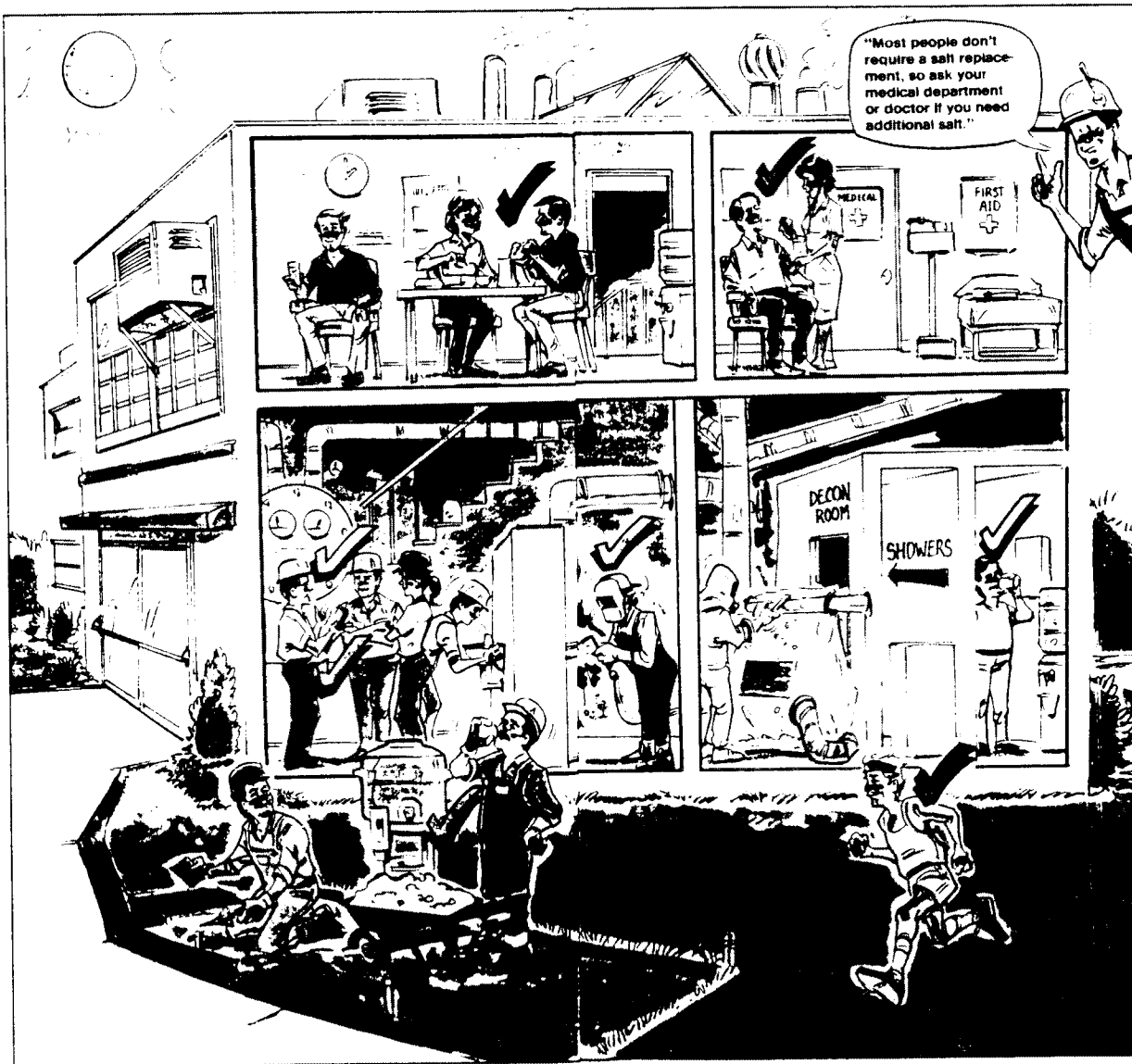
Increase the water you drink to replenish the water you lose from sweating. Drink more than you need to satisfy your thirst. It's best to replenish regularly by drinking small amounts frequently throughout the day. You may need to drink a glass of water or more every hour.

### ✓ Take Appropriate Breaks

Whether you need rest breaks depends on conditions such as air temperature, sun exposure, and how hard you're working. Your company monitors these conditions and establishes a safe work/rest regimen for you and your coworkers.

### ✓ Wear Proper Clothing

Your employer supplies you with heat-protective clothing and equipment, such as heat shields, if needed. When possible, wear loose, lightweight clothing, which encourages heat to be released



"Most people don't require a salt replacement, so ask your medical department or doctor if you need additional salt."

### ✓ Acclimatize Yourself

Your employer may give you guidelines to help you adapt to the heat. This natural process, called **acclimatization**, takes about 7 to 10 days. It usually consists of short periods of working in the heat, which gradually increase in time and intensity. If you spend time out of the heat due to vacation or reassignment, you may need to acclimatize yourself again.

### ✓ Stay in Good Shape

Conditioned muscles work more efficiently and generate less body heat, while extra body weight makes you work harder. People in good condition tend to acclimatize better because their cardiovascular systems respond better.

### ✓ Eat Wisely

Hot, heavy meals add heat to your body and divert blood to your digestive system, so eat lightly during your workday. Remember, too, a normal diet usually supplies all the salt you need to replace the salt lost through sweating.

### ✓ Know Special Risks

**Alcohol** (including beer), **caffeine**, **medications** such as those used to control high blood pressure or allergies, **medical conditions** including diabetes, **recent illnesses** such as flu, and **increasing age** all increase your risk of heat stress.



## "TEAMWORK HELPS YOU BEAT THE HEAT"

In many jobs, heat is a fact of life. Since too much heat can be harmful to your health and be a safety problem, your company wants to help you reduce the risk of heat stress by monitoring and controlling the work environment. Be sure to follow company procedures, such as adjusting gradually to working in the heat and drinking plenty of water. You'll feel better on and off the job knowing what heat stress is and how to prevent it.




**KRAMES**  
COMMUNICATIONS  
MORE THAN INFORMATION

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